

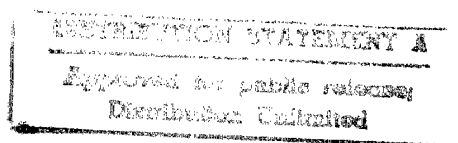
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# USSR Report

CHEMISTRY



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10 October 1984

USSR REPORT  
CHEMISTRY

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## ALKALOIDS

UDC 615.217.34:547.944.3].073

### UNIFIED METHOD OF PHOTOMETRIC EXTRACTION DETERMINATION OF TROPANE ALKALOIDS IN DRY EXTRACT AND IN TINCTURE OF BELLADONNA

Moscow FARMATSIYA in Russian No 3, May-Jun 84 (manuscript received 14 Jul 83)  
pp 76-78

BELIKOV, V. G., KARPENKO, V. A. and STEPANYUK, S. N., Pyatigorsk  
Pharmaceutical Institute

[Abstract] Development of a more rapid and sensitive method of quantitative assay of total tropane alkaloids in a dry extract and in a tincture of *Atropa belladonna* L. is described and discussed. Quantitative determination of the total tropane alkaloids in the medicines, according to glycerophosphoric acid, was performed by a titrimetric method after isolation of the alkaloids bases by multiple extraction with chloroform. Belladonna alkaloids level was calculated by the relationship of optical densities of chloroform extracts and the substance analyzed. Results are tabulated. References: 2 Russian.  
[286-2791]

UDC 547.944/975+547.856.1

### EXTRACTION OF CYTISINE FROM VEGETABLE MATERIAL USING LIQUEFIED AMMONIA

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 84  
(manuscript received 12 Oct 83) pp 29-31

DANIL'CHUK, D. N. and YANKOVSKIY, B. A., Chimkent Chemico-Pharmaceutical  
Factory

[Abstract] Conventional methods extract cytisine with aqueous ammonia or caustic soda followed by solvent extraction, carbonate precipitation and purification as nitrate; yields are only 36-50% and the process is labor intensive. But four-stage extractions of 1-1-1/2 hours each with liquefied ammonia at 33-35 C extracted up to 91-95% of the cytisine from lancet thermopsis seeds, alternate flowering thermopsis grass, and *Sophora griffithii* stocks stems. Approximately 90 gm of resinous extract from 0.4 kg of ground seeds was dissolved in 80 ml of water, acidified with sulphuric acid to pH 2, heated to boiling and held 5-7 minutes. The residue was separated and washed with water. The filtrates were combined, alkalized to pH 9.5-10 and extracted five times

with chloroform, yielding about 50 ml of extractant which was purified with charcoal and evaporated over a water bath. About 10 gm of resulting gross alkaloids were dissolved in ethanol, acidified with nitric acid to pH 4-4.5, and held for 2 hours at 10-15 C. The precipitate was filtered and washed with alcohol, yielding 9.8 gm of cytosine nitrate, or 66-69% of the starting content. The grass and stem extractions were carried out with similar methods and yielded 58-60 and 53-58% respectively. References 8 (Russian).  
[275-12672]

INFLUENCE OF CARBON SOURCES IN MEDIUM UPON COMPOSITION OF PHOSPHOLIPIDS IN FUNGUS OF GENUS FUSARIUM

Moscow FARMATSIYA in Russian No 3, May-Jun 84 (manuscript received 25 Mar 83)  
pp 16-19

IYEVLEVA, N. R., BRAGINTSEVA, L. M. and TENTSOVA, A. I., First Moscow Medical Institute imeni I. M. Sechenov

[Abstract] Study of the level and composition of lipids of *Fusarium sambucinum*, grown by the depth method, as a function of the nature of the carbon source in the medium, showed presence of a high level of phospholipids. Changing the source of carbon in the medium made it possible to vary the composition of lipids and phospholipids. The lipid level makes up 14-20 percent of the dry biomass. The highest quantity of phosphatidylcholine and phosphatidylserine resulted from growth of fungus on a medium containing ethanol while the highest level of phosphatidylethanolamine and phosphatidylglycerin was found in a medium containing molasses. Mycelium of the fungus may be used as a phospholipid source. There is the promise of use of such substances in medicines since phospholipids, close to plant phospholipids, may find use as biologically-active substances in preparation of medicinal preparations. References 13: 6 Russian, 7 Western.  
[286-2791]

## CATALYSIS

UDC 66.097:665.64

### CHEMICAL NATURE OF CATALYTIC PYROLYSIS OF HYDROCARBONS: EVALUATION OF RANGE OF EFFECT OF CATALYSTS ON PYROLYSIS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 5, May 84  
(manuscript received 13 Jan 83) pp 688-694

VASIL'YEVA, N. A., BUYANOV, R. A. and ZAMARAYEV, K. I., Institute of Catalysis, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] Analysis of experimental data concerning the role of processes of heterogeneous initiation, break off and continuation of the chain in hydrocarbon pyrolysis was used to assess the range of effect of heterogeneous catalysts on radical-chain pyrolysis. A mechanism of catalytic pyrolysis of hydrocarbons, which shows the chemical nature of heterogeneous catalysts, is described and discussed. Possible increase in rate of radical-chain pyrolysis of hydrocarbons in the presence of catalysts is discussed. References 16: 14 Russian, 2 Western.  
[285-2791]

UDC 547.56:66.095.252.001.51

### DIFFERENTIAL THERMAL ANALYSIS OF CATALYSTS OF PHENOL ALKYLIZATION PROCESS USING C<sub>8</sub>-C<sub>10</sub> ALPHA-OLEFINS

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 5, May 84 pp 111-114

OVANESOVA, G. S., SPIVAK, R. Ye., BAKHSHI-ZADE, A. A., ALIGULIYEV, R. M. and TALYBOVA, T. N., All-Union Scientific Research and Technological Institute for Low-Molecular Olefin Acquisition and Processing, Baku

[Abstract] Alkylphenols are widely used in plastics, synthetic rubber, petroleum stabilizers, pesticides and in other areas. The catalyst commonly used in their production does not permit regulation of isomer composition in the required direction, and promotes undesirable side reactions. The present article reports on the authors' efforts to reduce sulfo-group content in the KU-2 cationite used in the process. They also studied sulfosalts and cationites that had lost their activity through ammonia contamination. During the heating process, differential thermal analysis curves showed three endoeffects as the solvent was eliminated from the KU-2 catalyst. Isomeric composition of the alkylphenols obtained was confirmed by varying acidic properties of the

catalysts depending on the sulfosalts formed. Introduction of substituents into the cationite increased olefin conversion and yield of monoalkylphenols and reduced the reaction temperature by 20-40°C. The modified cationites yielded products of better quality. Figures 2; references 3: 2 Russian, 1 Western.

[288-12131]

UDC 541.128.13

#### OXIDATIVE DEHYDRODIMERIZATION AND AROMATIZATION OF ISOBUTYLENE ON ACIDIC TIN-CONTAINING CATALYSTS

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 5, May 84 pp 39-43

VISLOVSKIY, V. P., AZIMOV, A. B., PANKRAT'YEV, Yu. D., MAMEDOV, E. A. and RIZAYEV, R. G., Institute of Petrochemical Processes, AzSSR Academy of Sciences

[Abstract] Binary oxide systems based on tin dioxide are known to catalyze oxidative conversion of propylene to hexadiene-1,5 and benzene, depending on the acidic-basic properties of the catalyst. Weak acidity is necessary to avoid overly-rapid overall reaction and increase yields of oxygen-containing products. Another important feature is the absence of weakly-bonded oxygen on the catalyst surface. To test these principles, the authors studied various binary oxides containing tin in oxidative conversion of isobutylene and compared acidity and bond energy of surface oxygen of the tested catalysts. Variants contained bismuth, lead and titanium. The measure of catalytic activity was the rate of product formation at 773 K and the conversion of olefins. The oxygen bond energy was measured at 723 K. Results showed that simplification of the allyl-catalyst bond reduced the rate of dehydrodimerization of isobutylene. Aprotic centers at the allyl fragment caused a positive charge that promoted attachment of the oxygen anion, yielding products of oxidation. Use of catalysts with moderate oxidizing force was found to be preferable since they brought higher mobility of intermediate surface compounds of the allyl type. Figures 2; references 12: 6 Russian, 6 Western.

[288-12131]

UDC 543.253+881

#### ELECTROCHEMICAL CONVERSIONS OF OXYGEN ON VANADIUM OXIDE SURFACES

Moscow ELEKTROKHIMIYA in Russian Vol 20, No 5, May 84  
(manuscript received 29 Oct 82) pp 613-619

BRAYNINA, Kh. Z., BAZAROVA, E. V. and KHODOS, M. Ya., Sverdlovsk Institute of the National Economy

[Abstract] Vanadium oxides are widely used as oxidation-reduction catalysts and as electrode material in chemical sources of electrical energy. A study

was made of the electrochemical conversions of oxygen chemisorbed on the surface of  $V_2O_5$ ,  $V_3O_7$ ,  $V_4O_9$ ,  $V_6O_{13}$  and  $V_6O_4$  as a result of anode polarization and the relationship of the observed phenomena to the crystalline structures of these oxides. The powdered oxide was mixed in 1:9 ratio with powdered carbon and formed into electrodes after adding dibutyl phthalate or vaseline oil as binder. Anode and cathode potentials of the electrodes were then measured against a silver-chlorine reference electrode by a previously described method. Figures 7; references 18: 12 Russian, 6 Western.  
[281-12765]

UDC 541.128.3:546.881-44

#### STUDY OF PROPERTIES OF CATALYST SVS, SYNTHESIZED AT HIGH pH VALUES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 6 Dec 82) pp 775-779

MALKIMAN, V. I., KRAVTSOVA, I. A., DOBKINA, Ye. I., GRIBANOVA, L. M. and  
SAVEL'YEV, V. N.

[Abstract] A previous study of the effects of acidification showed that the activity of vanadium sulfuric acid catalyst SVS is minimal at  $H^+/VO_3^- = 1-2$  and maximum at 4.5-5.5 (pH < 1), although the strength is less. By lowering  $H^+/VO_3^-$  from 1 to 0 at pH = 3-7, the strength increases and so does the activity but not as high as in the acid range. In the present work it is shown that it is possible to synthesize SVS catalysts at pH = 7-7.5 which have 3-4 times greater strength than those prepared at pH < 1 while still maintaining high activity. It is also shown that catalysts synthesized in a neutral medium result in less equipment corrosion and preclude a catalyst calcining stage at 500°. Figures 3; references 2 (Russian).  
[270-12765]

UDC 541.128

#### DISSOCIATION TEMPERATURE OF OXIDES AND CATALYTIC ACTIVITY IN PROCESSES INVOLVING OXYGEN

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 8 Feb 83) pp 784-789

VITVITSKIY, A. I. and TYURYAYEV, I. Ya., State Institute for Applied Chemistry

[Abstract] The dissociation temperature ( $T_D$ ) of an oxide may be used together with other solid phase properties to characterize the catalytic activity of a heterogeneous system. Since the magnitude of  $T_D$  is related to



the thermodynamic characteristics of oxides and metals and with the total pressure, this makes it possible to predict the changes in catalytic activity of a heterogeneous system resulting from a number of factors, including the value of  $T_D$ . In a generalized case, these factors will result in a drop in specific catalytic activity, and if  $T_D$  then begins to approach the process temperature, the activity will increase, and if  $T_D$  is greater than or equal to the process temperature, the specific activity will be optimum. Figures 2; references 21: 19 Russian, 2 Western.  
[270-12765]

UDC 546.92:541.128

STUDY OF SURFACE COMPOUNDS OF PLATINUM ON ALUMINA-PLATINA CATALYSTS DURING THERMAL TREATMENT

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 28 May 83) pp 789-793

KRACHILOV, D. K., ZHARKOV, B. B. and TARASOV, B. P.

[Abstract] A comparison was made of several extraction methods of studying alumina-platina catalysts to obtain quantitative information about compounds of platinum with the catalyst samples after heat treatment at various temperatures. The data confirm the existence of at least two forms of platinum compounds with the carrier. Data obtained by extraction of platinum from the alumina-platina catalysts confirm the fact that more of this metal remains bound to the carrier following heat treatment. A solution of thiosemicarbazide in water and dimethyl sulfoxide was used to extract free and weakly-bound platinum from the aluminum oxide without destroying the carrier. Figures 2; references 12: 10 Russian, 2 Western.  
[270-12765]

## CHEMICAL INDUSTRY

### PROGRESS IN CHEMICAL INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 May 84 p 2

[Article by V. Listov, Minister of Chemical Industry: "Multifaceted Chemistry"]

[Text] Today, workers of all sectors of industry are carrying on a constant struggle to fulfill the party's additional targets: to achieve an increase in labor productivity of 1 percent over the plan and an additional 0.5 percent lowering of the prime cost of production. Resolution of this task depends on the rates of chemization of the economy. Widespread application of new chemical products and materials and improvements based on technological processes are making possible a significant acceleration of scientific-technical progress, which enables us to obtain high end results for minimal expenditures.

Let me give a few examples. The manufacture of one ton of natural silk requires 6000 man-hours. But a ton of synthetic thread, put out by our enterprises, requires only 300. And the artificial fiber is not only of no worse quality than the natural, but in many respects surpasses it.

The invasion of chemistry into other areas of industry is just as effective. For example, a ton of polyamide used as a construction material in machine building saves an average of six tons of metal--cast iron, steel, bronze, brass, copper. The savings in labor costs in this amounts to 8000 man-hours.

As we see, for production based on chemical processes, labor productivity is growing perceptibly, and the prime cost of production is decreasing. It is no accident that the Ministry of Chemical Industry is taking part in the execution of practically all integrated goal-oriented programs and the resolution of more than 50 important scientific-technical problems.

One such problem, closely linked with the high growth rate of volumes of capital construction in our country, is the replacement of metal pipes with polymer ones. In many cases, the strength properties of metals are not used rationally enough, and the low corrosion resistance of steel pipes causes them to break down prematurely.

Research carried out in the Plastik Scientific-Production Association has shown that 20-30 percent of metal pipes can successfully be replaced with polymer ones. But, it must be said immediately, the current output of them is a long

way from fully satisfying the demand. It is planned in the future to increase the production of such pipes to more than a million tons per year. This will save about 10 million tons of steel and cast iron.

It is of great importance to further increase the output of chemical fibers. Our country is known to be one of the chief producers of flax. But only about 40 percent of it goes to satisfy the population's demand for linen fabric. The reason? Two thirds of the flax goes to produce fire-hoses, cables, twine, cord, and other technical needs. So it remains a very important task to completely replace natural fibers with chemical ones in articles for technical use. This will make it possible not only to free flax resources to produce consumer goods, but also to significantly improve the quality of many technical materials. For example, the average service life of a conveyor belt made from fabrics based on synthetic fibers is one and a half times as long.

Chemists have special responsibilities to agriculture. We supply farmers with more than 200 specific materials. These are mineral fertilizers, chemical plant protection agents, feed preservatives, all sorts of films, and other polymer articles. Among them are some innovations. The 11th Five-Year Plan period saw the first widespread use of industrially-produced hay-baling twine made from synthetic filaments and monofilaments, which is completely eliminating the use of metal strips for hay baling.

An important role in carrying out the Food Program is being played not only by chemical materials, but also by chemical technology--for example, membrane technology. The use of membranes in the food industry increases the output of soft cheeses by 8-10 percent and cottage cheese by 15-20 percent. Using semipermeable membranes, it is possible, fairly simply, to create the necessary gaseous state for preserving fruits and vegetables. This helps keep them fresh from harvest to harvest.

We may say that the chemization of the economy has reached a significant level. But much still remains to be done. The assortment of chemical fibers, and the quality of many of them, is not yet adequate to organize broad-scale production of advanced articles for technical and consumer use, and fashionable modern clothing. For the last three years of the current Five-Year Plan, the Ministry of Chemical Industry has fallen short in deliveries to consumers of a large quantity of synthetic resins and plastics, caustic soda and soda ash, paint and varnish materials, polymer tubes, and thermosoftening plastics.

The development of production of new types of goods is still lagging behind the sharply expanding needs of related sectors. This is largely because of insufficiently effective use of the sector's productive and scientific potential, slow assimilation of capacities, and nonrational expenditure of material resources.

Recently our ministry has more than once been subjected to justified criticism. Serious conclusions have been drawn from this criticism. The necessary measures have been taken to stabilize the work of the sector's leading enterprises, strengthen labor and production discipline, and raise the responsibility of cadres. All this has produced results.

The year 1983 was a crucial one for the sector. For the first time in a long time the plan was fulfilled with respect to basic technical-economic indicators. The country received additional chemical products totaling about 300 million rubles.

Labor collectives and enterprise managements are convinced that better work is possible, that we have great potential capacities. Many did not believe that we could fulfill the plan for chemical fiber production. However, it was not only fulfilled but overfulfilled. Our effort now is to improve the work of the lagging associations, plants, and combines, of which there are still many.

We got the year off to a good start. In the first quarter, labor productivity in the sector as a whole rose by more than one percent. Additional lowering of the prime cost of production was more than half a percent. This creates excellent conditions for successful work in the future.

To do this it is necessary, above all, to create a businesslike atmosphere at all levels of control and at every work place, and not to permit even the smallest weakness or complacency in evaluating what has been achieved. As Comrade K. U. Chernenko observed in a speech at the April (1984) Plenum of the CPSU Central Committee: "Concern, even, if you will, anxiety for the state plan should not leave us even for a minute." If personnel collectives fulfill the obligations undertaken, it will be possible as early as this year to make up for the lagging which occurred in the first two years of the five-year period, and create the reserves needed for the sector to fulfill, successfully, the Five-Year Plan as a whole.

12255

CSO: 1841/273

## PROGRESS IN CHEMICAL INDUSTRY

Moscow STROITEL'NAYA GAZETA in Russian 27 May 84 p 1

[Article "The Steps of an Important Industrial Branch"]

[Text] On the occasion of a work holiday of chemists a correspondent of STROITEL'NAYA GAZETA asked the Deputy Minister of the Chemical Industry, I. Muradov, to answer several questions.

[Question] Ivan Mikhaylovich, the first question is a concrete one: How did the Branch workers react to their work holiday?

[Answer] I am delighted to note, that both as a result of the advances of last year, and of those of recent months of this year, the chemical industry is steadily fulfilling the plan according to the basic technical-economic indicators, including the production of the most important types of products.

In the Eleventh Five-Year Plan, chemistry, as one of the most important branches of socialist industry, which defines technical progress in the economy, continues to develop at a rapid pace. Concrete evidence of this is the bringing into operation, for three years of the five-year plan, more than 300 new large production capacities. The production of methanol and polypropylene was made operational at the Tomsk chemical factory, ethylene and polyethylene in the Kazan Association "Organicheskiy sintez", styrene and polystyrene at the Omsk and Shevchenko factories, plastics and a series of others. Today they have already furnished the economy with an important product.

[Question] Capital construction plays an important role in the growth of the production potential of the branch. What tasks of builders this year have to do with chemistry?

[Answer] The operationalization of approximately one hundred new large production capacities is imminent. What is hidden behind this figure? Many of these operational facilities are suppliers of raw materials for the production of very important chemical products. And this means that it is these that will give the possibility to increase significantly the production of the chemical product.

The installation objectives at the base of the compensational agreements which are at the base of finished imported equipment are under the basic control of

the Ministry of Chemical Industry. A subject of constant attention is also the construction projects that are connected with the realization of the supply program, and the production of goods in popular demand. Builders for the past four months of this year have successfully fulfilled the plan of work for the most important actuating objectives.

However, not everything is going well. At a number of our construction projects, a slowdown was permitted, which was significant. At an expanded session of colleagues of the Ministry of Chemical Industry, the organizational-technical measures for the removal of the deficiencies were examined and affirmed. We hope that our partners, the supplier ministries, will also take the necessary measures for supporting all of our current construction projects of the branch with material-technical resources and labor strength, for the unconditional operationalization of the planned production projects.

[Question] What peculiarities exist in this stage of the development of the industrial branch?

[Answer] First of all I would like to note that the volume of unfinished building has decreased according to plan. In our branch from the beginning of the five year plan it has decreased by 24%. The quantity of newly begun objectives has been reduced to a minimum. Their share in the general volume of building comprises only 4.5%. On account of the economic planned-volume decisions and the introduction of progressive technological processes, the share of capital investment that was earmarked for the creation of the active part of fundamental funds has increased.

We have also given special attention to the installation of facilities for the preservation of the environment and the rational use of natural resources. For the past three years, 225 million rubles has been spent for this, making 105 large facilities operational.

For the workers of the industrial branch 2,870,000 square meters of living space, children's preschool institutions for 14,000 places, general education schools, polyclinics and rest stations were made available.

At the February (1984) CPSU Central Committee Plenum, comrade K. U. Chernenko again emphasized that now it is important to preserve the established tempo, the general tuning for the practical solution of problems, to steadfastly raise the level of party and state leadership of the economy, to actively develop positive trends, to give to them a stable character. A fighting program of action is included for all of us in this order.

Taking this opportunity, I want, through STROITEL'NAYA GAZETA to congratulate the workers of the industrial branch and their true friends--construction workers and machine builders--on Chemist's Day.

12596  
CSO: 1841/282

## ALLENE GAS RESEARCH

Moscow KOMSOMOL'SKAYA PRAVDA in Russian 23 May 84 p 6

[Article by N. Khlebodarov]

[Text] Allene gas has been a sort of "laboratory paradox": its presence has not been noticed either among natural products or among the products of industrial synthesis. Today, allene is a treasure chest of chemical possibilities. The only Allene Chemistry and Technology Laboratory in the world is famous not only because it is located in the memorial room of the famous chemist I. D. Zelinskiy, but because of the whole pleiad of academicians who have emerged from behind its walls. The flower of domestic and world chemistry has worked in the laboratory, beginning with the "fathers of most of the procedures for processing oil": Zelinskiy, Nesmeyanov, Kazanskiy, Nametkin and ending with the "pure" chemist, Balandin. The direct links of the times are also examined in modern scientific research carried out by the Institute of Organic Chemistry and the Institute of Chemical Physics of the USSR Academy of Sciences. I asked the director of the laboratory, Doctor of Chemical Sciences Anatoly Taber, what the reason was for the attention persistently being paid to allene.

"Modern civilization is unimaginable without the substances obtained from the processing of hydrocarbon raw materials", he said. "However, it is catastrophically devouring these depletable sources. In our century alone, mankind has expended more oil and gas than in the 19 preceding centuries. Oil is the basis of modern organic synthesis, the scale of which is growing at an unheard-of rate. There is already every reason to term our century the century of plastics. Polyethylene alone will soon be produced in tens of millions of tons yearly." Yes, articles made of plastic have beautified our world, but have also given rise to many problems: thus, the industrial countries are literally suffocating in their own waste products... But the "plastics boom" has also prompted unexpected solutions. One of them is the use of the unusual properties of allene gas, which is invariably associated with polyethylene. Formerly it was simply burned off. Moreover, additional efforts have been made to utilize it, which has made polyethylene more expensive. There is not much of this gas available, but its properties are such that they can solve a big problem. The problem is that ethylene is a "dead molecule" to which it is almost impossible to attach anything. Try to preserve an inscription on polyethylene film. It doesn't "bind" any fillers, because it doesn't have any free bonds. It's different with polyethylene's associate, allene, a most unsaturated hydrocarbon. One of the first attempts to synthesize artificial rubber was

undertaken on its basis. This strikingly "lively" molecule is able to bring the "dead" ethylene molecule to life. And not only to bring it to life, but to lend it surprising properties: incombustibility, durability and even spontaneous decomposition. In short, to lend plastics the properties required by the modern age. Allene is born at very high temperatures and pressures and lives for only an instant. And this instant must be caught and extracted from the rest of the process. This molecule is like a tight resin braid which is ready to straighten out at the slightest touch. It is not by chance that chemists say that allene explodes at a glance. But this is also its advantage. In nature there is no more active molecule, which is able to attach to itself literally all of the substances in the periodic table. All that is needed is to learn to "restrain its activity" and to control it in an expedient manner. Admittedly, I didn't believe it when they told me that they would "extract" polyallene before my very eyes. I recalled the enormous reactors as high as a five-story building which I had seen at factories, and simply doubted that allene could come into existence directly in a flask. A rather simple chemical instrument. The temperature of the solution was only 60 degrees [Celsius] and the pressure was scarcely above atmospheric. In the pinkish (from the rhodium catalyst) water a white powder suddenly started to precipitate out--polyallene. The first polymer in the world based on allene! From the powder they even managed to make granules, which laboratory worker Olya Skopina casually removed from the flask. It remains to add that the workers at the laboratory have obtained more than 50 attestations of authorship in connection with the study of allene.

12344

CSO: 1841/266



#### BRIEF

ARMENIAN PLASTICS PRODUCTION UP--"Not a single collective unit lagging behind"--this is the slogan under which the chemists of the Yerevan Association "Polivinilatsetat" are working this year. Everywhere strengthening labor and technological discipline, skillfully finding and utilizing internal reserves, they are appreciably ahead of their production schedule. The chemists have fulfilled the task, by more than 60 percent, of producing consumer goods and, from the beginning of the year alone, have produced above-plan by almost two million rubles, including 500 tons of rare synthetic resins and plastics. And all of this without lowering production quality. The output of articles with the Pentagon of Honor has reached 26.2 percent in overall production volume, exceeding the planned level. By comparison with the same period last year, labor productivity increased by almost 20 percent, and production costs decreased by 0.7 percent. One of the collective's fundamental obligations has also been successfully fulfilled--there is now not a single lagging enterprise, shop, section or brigade in the association. R. Movsesyan's brigade, the best in the Association, is confidently leading in the competition for fulfillment of the yearly assignment ahead of schedule. [By N. Ordinyan] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 May 84 p 1] 12344

CSO: 1841/266

## COAL-TAR CHEMISTRY AND FOOD PROGRAM

Moscow KOKS I KHIMIYA in Russian No 6, Jun 84 pp 2-3

ZAYCHENKO, V. M., RUDKEVICH, M. I., Scientific Research Institute of Coal Chemistry and SOKOLOV, V. Z., Eastern Scientific Research Institute of Coal Chemistry

[Abstract] In support of the Food Program approved by the Central Committee in May 1982, the Ministry of Ferrous Metallurgy issued an implementing program for agricultural chemicals in October 1982. Ammonium sulfate is the largest item and caking is a serious problem; the program includes equipment to admix anti-caking additives such as sulfonol, iron salts, or granulated slag and ash. Increasing crystal size is also being investigated as a means of improving flow. In addition, an increase in capacity at coke plants will increase production by 90,000 tons a year. More attention is being given to recovering sulfuric acid, though its use is limited by strict color standards for the ammonium sulfate. A shift of some ammonia production method to a phosphate cycle will reduce sulfuric acid consumption. Colloidal sulfur is another important agricultural chemical, but production has been limited by construction shortfalls which must be corrected. Creolin, used in anti-mange animal dips, is produced with the use of colophony, but experiments are in progress to substitute less expensive acarisol or synthalin. Production of dicyclopentadiene, used for making heptachlor, will be increased to about 200 tons a year. More attention is also being paid to environmental impacts, particularly of waste water. A program to provide paved roads to all state and collective farms will require increased production of paving materials. Finally, a program to use resins from the indene-coumarone fraction of raw benzene in the lacquer industry will reduce the industrial demand for edible oils by 5-6,000 tons a year and provide better quality lacquers.  
[291-12672]

## COAL GASIFICATION

UDC 662.741.355:533.1.004.82

### COMPOSITION OF CIRCULATING AND VENTED GASES OF UNIT FOR DRY SLAKING OF COKE

Moscow KOKS I KHIMIYA in Russian No 6, Jun 84 pp 17-19

ROD'KIN, S. P., KOROBEYNIKOV, A. P., USHAKOV, Ye. B. , CHALYKH, G. N.,  
ZOTKIN, V. P., KAPLENKO, A. A., Kuznetsk Branch, Eastern Scientific Research  
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Siberian Metallurgical Combine

[Abstract] In coke production, the gas composition can indicate the weight loss, the explosive danger, and to some extent the quality of the coke being produced. Gas samples were taken from the upper and lower ring channels, the exit of the economizer and the preheating chamber within 1 minute after a fresh charge of hot coke and at 5 or 10 minute intervals. They were chromatographically analyzed for  $H_2$ ,  $CO_2$ ,  $O_2$ , and CO. At a process rate of 46 tons/hour and a gas discharge of 1600  $m^3$ /ton, flammable components in the circulating gases reached a maximum in about 10 minutes (7% CO and 1.5%  $H_2$ );  $CO_2$  conversely reached a minimum of 11% at approximately the same time. Oxygen showed only a slight tendency to increase toward the end of a charge period. Gases in the preheating chamber showed a maximum of  $H_2$  (16.0%) and CO (19.1%) within the first five minutes, dropping to 0 and 6% respectively by the end of the charge period. When the gas discharge was raised to 1700  $m^3$ /ton, the flammable components in the circulating gases were somewhat lower and in the preheating chamber the concentrations of  $H_2$  and CO dropped significantly more slowly. When the process rate was halved,  $CO_2$  concentrations were slightly lower and CO a bit higher, apparently due to the higher relative availability of oxygen. Incomplete conversion of coke was also examined. CO concentration was lowest of the 3 cases and there was no  $H_2$  in the circulating gases, but higher in the preheating chamber where methane was also present. The high physical and chemical heat potential of these vented gases should not be wasted. Figure 1; references 4 (Russian).  
[291-12672]

## COMBUSTION

UDC 662.75

### PYROLYSIS OF n-OCTANE ON ZEOLITE-CONTAINING CATALYST

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 5, May 84 pp 22-24

BAYRAMOV, M. R., AMINBEKOV, A. F. and MAMEDOV, S. E., Azerbaijan State University imeni S. M. Kirov

[Abstract] Pyrolysis of hydrocarbons at 600-800°C in the presence of various catalysts has received considerable recent attention, but zeolite and zeolite-containing catalysts have rarely been used. The present article reports on use of such catalysts for pyrolysis of n-octane in a temperature range of 650-750°C with contact time of 0.5 second and 1 : 1 ratio of n-octane and water. Zeokar-2 catalyst was modified with potassium or chromium oxides by joint saturation. Results showed that gas emission increased up to a temperature of 730°C, along with deepened decomposition of n-octane and reduced butylene yield. At higher temperatures, secondary tar- and coke-formation processes reduced the yield of gaseous products. The zeolite-containing catalysts brought increased yields at lower temperatures with improved selectivity and less formation of secondary products. Figure 1; references 5 (Russian).  
[288-12131]

UDC 661.21:536.46

### COMBUSTION OF SULFUR DROPS AND TRANSITION OF DIFFUSION BURNING TO EXPLOSIVE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 20 Dec 82) pp 919-921

SHELYAKIN, A. P., KLEPACH, A. S. and VASIL'YEV, B. T., Voronezh Engineering-Design Institute; Scientific Research Institute for Fertilizers and Insecto-fungicides imeni Prof. Ya. V. Samoylov

[Abstract] The first stage in the production of sulfuric acid from elemental sulfur is combustion of pulverized sulfur to sulfur dioxide in a flame jet. The intensity of this process is governed by the combustion of the flame jet. A study shows that drops of molten sulfur 100 mcm or less burn in the diffusion zone, and drops of 160 mcm or greater burn in the explosive range, 100-160 mcm being a transitional zone. The combustion process may be further intensified by dispersion of the droplets to 130-200 mcm or to not less than 90 mcm. Figures 3; references 5 (Russian).  
[270-12765]

## ELECTROCHEMISTRY

UDC 541.138

### STUDY OF HYDRIDE-HYDROGEN ELECTRODES

Moscow ELEKTROKHIMIYA in Russian Vol 20, No 5, May 84  
(manuscript received 11 Nov 82) pp 632-636

NGUYEN, Ba T'at and LEVINSKAS, A. L., Vilnius State University imeni  
V. Kapsukas

[Abstract] It was previously shown that the potential on a hydride-hydrogen electrode is at equilibrium and that the total reaction is not encumbered by secondary processes. To clarify the mechanism of the electrode reaction, a study was made of the kinetic parameters of a hydride-hydrogen electrode and the relation of these parameters to the structure of various ether-electrodes, temperatures, nature of the electrode material and degree of hydrogenation. Ether electrodes were synthesized from lithium hydride and aluminum chloride. The presence of aluminum atoms in the hydride anions was confirmed. Figures 4; references 16: 15 Russian, 1 Western.  
[281-12765]

UDC 541.138:577.158

### BIOELECTROCATALYTIC CONVERSIONS OF HYDROGEN PEROXIDE AND LACTATE ON SOLID ELECTRODES

Moscow ELEKTROKHIMIYA in Russian Vol 20, No 5, May 84  
(manuscript received 11 Nov 82) pp 637-641

KULIS, Yu. Yu. and SAMALYUS, A. S., Institute of Biochemistry, LiSSR Academy of Sciences, Vilnius

[Abstract] A key problem of bioelectrocatalysis is the creation of an effective electron exchange between an electrode and the active site of an enzyme. In a direct exchange of electrons, i.e., without a mediator, the enzyme electrons either become adsorbed on the current-carrying material or are immobilized by a covalent bond. In the present work a study was made of the kinetics of catalytic reduction of hydrogen peroxide and oxidation of L-lactate in the presence of peroxidase and cytochrom B<sub>2</sub> enzymes adsorbed on solid electrodes consisting of wax-impregnated graphite or an organic charge transfer complex. Modification of the electrodes with polyethylene increased

the limiting biocatalytic current for L-lactate oxidation by a factor of 4.5-32, but also suppressed reduction of hydrogen peroxide. The influence of potential, pH and modifier is apparently due to changes in the surface state of the electrodes and formation of electrocatalytically active enzyme-electrode complexes. Figures 4; references 21: 9 Russian, 12 Western.  
[281-12765]

UDC 547.314.2:548.562:66.02

ABSORPTION OF ACETYLENE IN LIQUID GAS ACCUMULATOR WHILE USING ACETYLENE-ACETONE GAS HYDRATE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 23 Jun 82) pp 759-762

BOGUSLAVSKIY, E. A. and SAMOSUDOV, Yu. I.

[Abstract] The technological possibilities of acetylene gas accumulators employing acetone as absorber are limited by the pressures corresponding to the degassification temperature. By introducing an acetylene-acetone double gas hydrate  $2C_2H_2 \cdot (CH_3)_2CO \cdot 17H_2O$  into the cycle, absorption can take place at pressures near 0.1 MPa and at temperatures attainable by brine cooling. Although the absorption capability of the solvent increases markedly by binding water, the decomposition phase of the gas hydrate during the degassification stage causes a decrease in the absorption capability of the acetone due to water dilution, which in turn raises the acetylene pressure over the solution at low temperatures. A quantitative study of the effects of the acetylene-acetone gas hydrate during the acetylene accumulation cycle showed that higher acetylene pressures at low degassification temperatures ( $20^\circ$ - $21^\circ$ ) are possible when employing the above acetylene-acetone gas hydrate formation-decomposition cycle. Figures 3; references 3 (Russian).  
[270-12765]

UDC 621.351:547.493.422:543.544.45:543.51

ANALYSIS OF IMPURITIES IN PROPYLENE CARBONATE FOR CHEMICAL BATTERIES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 4 May 83) pp 879-886

ZENKEVICH, I. G., BYSTROVA, G. I. and IOFFE, B. V., Leningrad State University imeni A. A. Zhdanov; All-Union Scientific Research Battery Institute

[Abstract] Propylene carbonate, an electrolyte solvent used in high energy lithium battery cells, must be in a high state of purity. The present work is directed towards the development of a chromato-mass-spectrometric technique to detect impurities present in Soviet-produced propylene carbonate. Basic

impurities consist of water, carbon dioxide, propylene oxide, propylene glycol and the three isomers of dipropylene glycol. Vacuum distillation at 85°-100° removes most of the water, although there is a simultaneous increase in hydrolysis products and thermolysis products of the base ester as well as the appearance of new products such as allyl alcohol, propylene chlorohydrin, acetol and its reaction products with propylene oxide. Gas chromatographic determination of propylene glycol is made difficult due to its possible formation by hydrolysis of propylene carbonate in the chromatograph evaporator. This may be entirely prevented by silanization of the chromatograph column and dosing the sample onto silanized glass wool. Any such technique must include a check for the absence of a relationship between the areas of the propylene glycol peaks and the temperature of the evaporator. References 18: 8 Russian, 10 Western.  
[270-12765]

UDC 534.222.2

ROLE OF PHASE STATE OF CARBON IN EVALUATING DETONATION PARAMETERS OF  
CONDENSED SUBSTANCES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 5, May 84  
(manuscript received 26 May 83) pp 754-759

GUBIN, S. A., ODINTSOV, V. V. and PEPEKIN, V. I., Institute of Chemical  
Physics, USSR Academy of Sciences, Moscow

[Abstract] The effect of condensed carbon in detonation products on the accuracy of calculation of detonation parameters is analyzed and described. A physically-valid assumption concerning existence of a diamond form of carbon in the Chapman-Jouget plane is presented. This permits significant increase in accuracy of thermodynamic calculations of detonation parameters. Figure 1; references 17: 11 Russian, 6 Western.  
[285-2791]

UDC 534.22.2\*536.7

CALCULATION OF PARAMETERS OF SHOCK WAVES IN AIR AFTER DETONATION OF GAS  
MIXTURES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 6, Jun 84  
(manuscript received 31 May 83) pp 879-884

GEL'FAND, G. Ye., GUBIN, S. A., MIKHALKIN, V. N. and SHARGATOV, V. A.,  
Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Dynamics of formation and propagation of 1-dimensional, plane pressure waves, forming after detonation of combustible gas mixtures of various composition, were studied with the aid of numerical calculations. A method of exact calculation of parameters of state of detonation products, based on an approximation of thermodynamic equilibrium values of parameters for the isentrope of expansion is described and discussed. The relationship of calculated values of pressure and energy of shock waves to distance is described. Calculations by the exact method closely approximate values calculated when  $\gamma_{\text{eff}} = \gamma_s = (\delta \ln p / \delta \ln p)_s$  if there are no irreversible losses of energy in the detonation products. Figures 4; references 15: 11 Russian, 4 Western.  
[284-2791]



INORGANIC COMPOUNDS

UDC 541.138.3:54-183:546.26

INFLUENCE OF TREATMENT TEMPERATURE ON ADSORPTIVE AND ELECTROCHEMICAL PROPERTIES OF ACTIVATED CARBON IN REACTIONS OF ELECTROREDUCTION OF MOLECULAR CHLORINE

Moscow ELEKTROKHIMIYA in Russian Vol 20, No 5, May 84  
(manuscript received 25 Nov 82) pp 649-655

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[Abstract] A study was made of the effects of the temperature at which activated carbon was treated on its physical chemical, electrochemical and adsorptive properties in respect to reduction of molecular chlorine. It is demonstrated that carbon, treated at 1500°C has the greatest adsorptive and electrochemical activity per unit weight. This effect is apparently related to the change in physical properties of the carbon catalyst mainly through ordering in crystal structure and growth in crystal dimensions. Figures 5; references 16: 13 Russian, 3 Western.  
[281-12765]

UDC 541.126+546.47.821.76

INTERACTION OF METALS WITH WATER UNDER CONDITIONS OF DYNAMIC COMPRESSION

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 6, Jun 84  
(manuscript received 28 Sep 83) pp 905-906

VATSANOV, S. S., LAZAREVA, Ye. V. and KOPANEVA, L. I., All-Union Scientific Research Institute of Physico-technical and Radio-technical Measurements, Moscow Oblast, Mendeleyevo

[Abstract] Shock compression of mixtures of powdered metals and water in storage vials was studied by X-ray and infra-red spectroscopy methods. It was found that oxides or hydroxides are products of shock compression for metals more active than hydrogen while no chemical interaction with water occurs when metals are less active than hydrogen. During shock compression and afterward, the water is at rather high pressure and the metals, in this state, are dissolved. Dynamic experiments with a zinc + water system with preliminary cooling of the vial with liquid nitrogen produced the same result, formation of zinc oxide. References 3: 2 Russian, 1 Western.  
[284-2791]

## METHOD FOR PREPARING ULTRA PURE BROMINE USING CRYOGENIC VACUUM TECHNIQUE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 7 Sep 83) pp 905-906

GOSPODINOV, G. G. .

[Abstract] Existing methods for bromine purification consist of either treating the crude bromine with sulfuric acid followed by distillation, or by distilling it in the presence of chlorine followed by absorption with sulfuric acid and careful fractionation. During the distillation, some colloid-sized droplets are carried over into the condensate and contaminate it. In the present work, a cryogenic vacuum technique was developed in which the distillation is carried out at temperatures below the boiling point of bromine in a special reactor. Figure 1; references 6: 1 Russian, 5 Western.  
[270-12765]

APPLICATION OF METHOD OF STANDARD POROSIMETRY TO STUDY POROUS STRUCTURE OF  
ION EXCHANGE MEMBRANES

Moscow ELEKTROKHIMIYA in Russian Vol 20, No 5, May 84  
(manuscript received 26 Nov 82) pp 656-664

VOL'FKOVICH, Yu. M., LUZHIN, V. K., VANYULIN, A. N., SHKOL'NIKOV, Ye. I. and  
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[Abstract] Swollen ion exchange membranes may be considered to be porous bodies with ionogenic groups fixed to the walls of the pores. Literature data on the porous structure of ion exchange membranes refer mainly to the dry state, although their structure in the wet swollen state is markedly different, often by 1-2 orders of magnitude. Most porosimetric methods such as mercury porosimetry and electron microscopy apply only to dry specimens. In the present work, standard porosimetry was confirmed as a method for studying the porous structure of ionites. The change in structure of a number of ion exchange membranes following their swelling in water was studied and the mean distance between ionogenic groups was determined. The influence of several factors on the structure of carboxyl-containing membranes was studied. Figures 7; references 24: 16 Russian, 8 Western.  
[281-12765]

## PESTICIDES

### ECONOMICS OF USING PESTICIDES

Moscow ZASHCHITA RASTENIY in Russian No 1, Jan 83 pp 24-26

[Article by Prof. V. A. Zakharenko: "Economics of Using Pesticides"]

[Text] Measures taken to protect harvests are highly significant to the production of food and agricultural raw materials. Each year, due to the spread of plant pests, diseases and weeds, world-wide agriculture sustains a 35% loss in the fields and another 10-20% loss in storage. In total, this is practically half of the entire harvest.

In our country, since the first years of Soviet power, great attention has been devoted to problems in protecting the harvest. While the assortment of pesticides in the 1920's and -30's was very limited, and chemical control of plant pests and diseases was conducted on relatively small areas, the post-war years brought rapid development to the chemical method, greatly facilitated by the appearance of chlororganic and organophosphorus insecticides and herbicides--derivatives of phenoxyacetic acid.

The great effectiveness of organic compounds in the struggle with harmful organisms, their selectivity to crops and the relatively low consumption norms and costs provided the groundwork for making pesticides an important factor in the intensification of agriculture. Development of the chemical industry made it possible to enlarge the areas protected by chemical resources. Qualitative improvement also grew with increasing use of the chemical method. Organic herbicides started to be used in 1950-1960. In 1950, agriculture received 130 tons of preparations from the 2,4-D and 2M-4X group; in 1957, -- 845 tons of sodium and 400 tons of ammonium salts of 2,4-D. This helped to increase the list of crops being treated, and included corn, particularly; in 1960 deliveries of the sodium salt of 2,4-D reached 3959 tons, ammonium salt -- 459 tons, 32% butyl ester -- 285 tons, 80% 2M-4X -- 700 tons, and 50% Simazin -- 100 tons.

Throughout the decades, successes in herbicide production made the chemical method of weed control acquire economic significance, becoming a major technological link in the agricultural technology of wheat, corn and flax.

In accordance with the March (1965) Plenum of the CPSU Central Committee, the material and technical bases of agriculture were strengthened. Full mechanization, use of chemicals and land reclamation had begun. As a result of the

wide-spread use of mineral fertilizers, introduction of soil conservation systems and land reclamation measures, the danger of harvest losses due to harmful organisms grew markedly. To provide a basis for protective steps, data were collected on the spread and harmfulness of various species and estimates of possible damage were made.

Potential harvest losses due to harmful organisms over the past two decades were practically not lessened in a relative sense, i.e., in percent of the harvest, but with a significant growth in gross output of crop production, losses in mass increased considerably.

In 1960 our country had a gross agricultural production of 31.6 billion rubles, and the potential harvest losses due to pests, diseases and weeds comprised 8.1 billion rubles. In 1970 these figures equaled, respectively, 44.1 and 11.3 billion rubles, and in 1980--54.3 and 13.9 billion rubles.

The progress in growth in potential loss of harvest due to pests, diseases and weeds is explained as being due to the improved conditions for growing crops which favor to an equal and often greater degree the growth of harmful organisms. It takes place in other countries also. Thus, in the United States according to periodic estimates by the Ministry of Agriculture [sic] in 1937, damage due to pests and diseases was 0.8 billion dollars, in 1965 -- 7 billion, in 1970 -- 8.2 billion, and including loss due to weeds -- 11.1 billion dollars.

Potential losses, or, in other words the possible increase in harvest with total suppression of harmful organisms, or prevention of the negative consequences of their vital activities, comprise, in percent of actual harvest in our country over the past 10 years: for grain -- from pests 6%, from diseases 8.4%, from weeds 10.6%; for flax -- respectively, 3.5, 8 and 10%; for cotton -- 11, 9 and 7.5%; for sugar beets -- 5, 20 and 6.5%; for vegetables -- 8, 9 and 10%; for fruits and berries -- 7, 15 and 7.2%; for grapes 5, 22 and 7.2%. The total financial losses (average, taking value loss into account) due to pests, diseases and weeds reach 25.7%.

Opportunities for saving harvests are realized in the process of using pesticides and are determined by the assortment and deliveries, which in turn are tied to the level of development of the chemical industry. In the Soviet Union high growth rates are provided for the production of chemical means for plant protection: in 1965 -- 103,000 tons (by d.v. [deadweight?], in 1970 -- 164,000 tons, in 1975 -- 264,000 tons and in 1980 -- 283,000 tons. In 15 years, the areas of protected workings doubled. Use of the biological method expanded considerable. In 1980, exterminating operations against pests and plant diseases were conducted on 88 million hectares in a single counting, which included 15.5 million hectares using biological means; chemical weeding on 67.8 million hectares, defoliation and desiccation -- on 5.3 million hectares. Mean annual areas protected against pests, plant diseases and weeds grew in comparison to the previous five-year plan by 27 million hectares, or 20%.

Large growth in the use of pesticides also raises the danger of polluting the environment, so that more attention had to be paid to correct use of the pesticides and to using biological means.

In the 1970's steps were taken to sharply reduce the discharge of chlororganic pesticides in the environment. This was then reflected in the assortment: an increase in the production of preparations which are less stable, but safer for humans and useful fauna. As a rule, these preparations are more costly than those used previously. This tended to raise expenditures on harvest protection. Prices for pesticides increase in comparison to the period of wide-scale utilization of chlororganic compounds: for insecticides from 1911 to 2794 rubles, for fungicides from 236 to 485, for herbicides from 1908 to 2183 and for defoliants from 487 to 788 rubles per ton.

The increase in treated areas and prices for preparations raised the need for economic justification of protective measures. Scientists at the All-Union Scientific Research Institute of Plant Protection, All-Union Scientific Research Institute of Agricultural Economics, All-Union Scientific Research Institute of Biological Means of Plant Protection and the Central Scientific Research Laboratory [TsNILP--?] developed sufficiently accurate methods for evaluating economic effectiveness. It is computed by group of harmful organisms (pests, diseases and weeds) on basic crops and is based on the ratio between the harvest saved and the cost for chemicals.

Data on areas treated by individual groups of preparations (against basic harmful organisms according to service of plant protection) and information on their effectiveness and results of field tests are used as initial data. The ratios of crop areas with various levels of infestation with harmful organisms to the technical effectiveness of the means being used are also computed.

Indices, reflecting the action of pesticides under favorable conditions (by observing optimal regulations) on sowings with high or moderate levels of infestation with harmful organisms are presented in Table 1.

Summary indices of the economic effectiveness of pesticides were evaluated according to the proposed methods. As a result of using disinfectants, the harvest saved during 1976-1980 was estimated at 494 million rubles, annually, for a cost of 51.6 million rubles for chemical treatment, and if overhead and expenses for gathering in the saved harvest are taken into account--120.9 million rubles, i.e., the net profit comprised 371.1 million rubles.

Insecticides and fungicides provided the greatest harvest supplement--4137 million rubles/year. At 797 million rubles outlay for chemical protection and 313 million rubles for pesticides, the profitability on supplemental expenditures comprised 419% (Table 2).

Areas treated with herbicides increased greatest of all during the 10th Five-Year Plan, because they lessen the labor for weeding and maintenance of sowings. Herbicides used on 59 million hectares provided supplemental agricultural production of almost 1.8 billion rubles (Table 3). Manual labor costs for weeding decreased by 436 million rubles.

Defoliants also are high in profitability. Using them on 5.3 million hectares of cotton for pre-picking removal of leaves resulted in 365 million rubles supplemental annual income and 540% profitability realized in savings in picking raw cotton and in improvement in fiber quality.

Over the past 20 years, the economic significance of the chemical method for plant protection grew significantly. The value of the excess harvest, gathered as a result of using pesticides, increased on the average from 2.2 billion rubles in 1960-1965 to 7.2 billion rubles in 1976-1980, while that of using insecticides, fungicides and disinfectants from 1.9 to 4.6, herbicides, defoliants and desiccants from 0.3 to 2.6 billion rubles.

Chemical means of plant protection became an important factor in the intensification of agriculture. As a result of using it, 6 to 16% of the total volume of productive production of individual crops are being saved (Table 4), while the total for the 9th Five-Year Plan was 11% of gross agricultural output, and 12.7% for the 10th Five-Year Plan.

At the contemporary level of using pesticides, not all of their possibilities are yet being realized: only half of the harvest is kept from being lost, which gives grounds for expanding the chemical method of protection.

The USSR Food Program, approved at the May (1982) Plenum of the CPSU Central Committee, foresees further growth in the use of chemical means of plant protection. It is planned to deliver 680,000 tons of pesticides to agriculture in 1985, and 750-790,000 tons in 1990. At high rates in the use of chemicals, the yield from using them must increase during the current five-year plan to 10-15%.

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12765

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## PETROLEUM PROCESSING TECHNOLOGY

### BENZINE-HYDROGEN FUEL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 Jun 84 p 2

[Article "Fuel of the Future"]

[Text] On the outside this "Volga" is not different from other automobiles. Why was it demonstrated in the exposition "Hydrogen Energy. Problems of Transportation and Ecology"? The answer is simple: the motor of this car operates on a benzine-hydrogen fuel. And with this power it not only expends 30-40% less benzine but emits into the atmosphere almost twenty times less carbon dioxide than the conventional motor. Until recently, the widespread introduction of hydrogen fuel was hindered by the absence of effective means of production. But today at the exposition several such methods have already been presented. One of these was developed by scientists of the Institute of Organic Catalysis and Electro-chemistry of the Kazakh SSR Academy of Sciences. They created a catalytic alloy in the presence of which hydrogen is easily separated from water.

12596

CSO: 1841/282



## GAS CONDENSATE AUTOMOBILE FUEL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 31 May 84 p 2

[Article by Yu. Kruzhilin, Tashkent: "From the Well Directly to the Tank"]

[Text] Can an automobile run directly on crude oil extracted from the well? This question will cause most people perplexity. But we will not hurry to the final conclusions.

If you have ever seen natural gas shooting up out of a well, then surely you remember the whistling, hazy plume above it. Fuel usually does not come to the surface in a pure form, but mixed with condensate. This condensate is usually separated from the gas and sent to petroleum-processing plants, where it is used to make diesel fuel. But now, as it turns out, the last operation can be eliminated.

Experiments carried out in Tashkent Highway Institute proved that condensate put into the tank directly from the well can serve as an excellent fuel for diesel engines. It lowers the fuel cost and increases the life of the motors. And the concentration of harmful substances in the exhaust decreases to nearly one half.

Over the course of a year and a half, more than 500 very different automobiles--Kamazes, MAZes, KrAZes, and Ikaruses--have been tested under the painstaking observation of specialists. Half of these cars were filled with the usual diesel fuel and served as the control group. The other half ran on gas-condensate fuel. Experiments were done in the auto industries of Tashkent, Bukhara, and Chirchik, where, as a result, about 400 tons of fuel were saved.

"Yes, we have managed to prove that diesel engines can run directly on pure condensate obtained in the fields," explains E. P'yadichev, docent at the Tashkent Highway Institute. "But there is one detail: to do this they must be suitably adjusted. Not every mechanic is capable of handling this operation. In order to eliminate it, we proposed mixing the condensate with ordinary diesel fuel in the right proportion. It was not easy to find these proportions. They depend not only on the make of the engine, but also on what field the condensate came from..."

Having established their "fuel base" in the Fergana Petroleum-Processing Plant, scientists tested condensates taken from the Turkmen oil fields Ochag and Naip,

and also from Gazli, Mubarek, Shurtan, Kultak, and Urtabulak in Uzbekistan. Based on these, they managed to produce highly effective, economical, good-burning mixtures called GCF--gas condensate fuels.

"There are a multitude of advantages to using GCF," the scientist continued. "For example, in order to process petroleum into automobile fuel, a considerable amount of energy must be expended. Now it is conserved. At the same time, it frees petrochemical facilities. And fuel expenditure per ton-kilometer, as experiments have shown, is lowered by an average of 8 percent."

Along with the Tashkent scientists, colleagues from the Moscow All-Union Scientific-Research Institute of Natural Gases, Scientific Automotor Institute, and All-Union Scientific-Research Institute for Petroleum Processing took part in the work. The experiments were overseen by A. Mutalibov, Rector of Tashkent Highway Institute, and Sh. Niyazbekov, Deputy Minister of Uzbek Motor Transport. Now the work on GCF has entered the most difficult stage--adoption. Calculations show that the condensate being extracted from Uzbek oil fields is enough for all the diesel automobiles in a large city such as Tashkent. And this means hundreds of thousands of tons of fuel saved per year.

But the scientific quest goes on. Scientists' plans for the future include using condensate not only in diesel engines but also in carburetor ones. Researchers believe that even crude oil, without any processing, can be used as a fuel. Two trucks filled with oil from the Gazli field are already undergoing testing. As yet this is a sort of "test of strength," to be followed by broad experiments.

12255

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UDC 665.75:543.422.4

SOURCE FOR FORMATION OF OXIDATION PRODUCTS IN PETROLEUM MOTOR FUELS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 4, Apr 84  
(manuscript received 4 Nov 82) pp 891-894

CHERTKOV, Ya. B. and KIRSANOVA, T. I.

[Abstract] Straight-run distillate motor fuels are subject to air-oxidation during long term (many years) storage. Data are presented as part of a 30-year on-going study of jet and diesel fuels which include some hydrofined fuels. The latter are especially significant since they contain only trace amounts of heteroatomic compounds. This study shows that these heteroatomic compounds are the primary source for the formation of oxygen compounds. Nitrogen compounds are the next major source, followed by alkyl aromatics. References 8 (Russian).  
[270-12765]

## PHARMACOLOGY AND TOXICOLOGY

### TRICOTHECENE TOXINS

Moscow KHIMIYA I ZHIZN' in Russian No 5, May 84 p 85

[Letter to the editor by A. A. Trostanetskiy, USSR Academy of Sciences, Institute of Microbiology and Virology, Kiev]

[Text] The June issue of KHIMIYA I ZHIZN' for last year contained B. Silkin's interesting article "Did Wallpaper Destroy Napoleon?". But a perplexing paragraph is one in which the author writes: "Quite recently the London pathologist (R. Shental) referred to a microscopic fungus fusarium which, in damp habitats, secretes what is known as trikotecene [trikotetsen]."

In the first place, Fusarium is the name of a genus of microscopic fungi, so it must be written with a capital letter. Second, "what is known as trikotecene" is correctly called trichothecene [trikhotetsen], or even better, trichothecenes, since there are now around 30 known trichothecene toxins produced by members of the genus Fusarium. The word "trichothecene" comes from the name of the Trichothecium genus; it was from the Trichothecium roseum fungus that substances of this group were first obtained.

Furthermore, the toxicity of Fusarium fungi has been well known for a long time. A great contribution in the study of the etiology of diseases caused by toxins of various species of Fusarium has been made by Soviet scientists (see, for example, V. I. Bilay's book "Fuzarii" [Fusaria], Kiev, Naukova dumka, 1977). Later, the author writes that, in experimental animals, the fungus very rapidly damaged the walls of the stomach... Most likely, the stomach walls were damaged, not by the fungus, but by the trichothecene toxin.

And finally. Fungi of the Fusarium genus are spread mainly in temperate climate zones, and indeed, food products contaminated by them can be dangerous to humans. On the island of Saint Helena where, so the author writes, the yearly average temperature is +23 degrees C, these toxins do not accumulate in food. So, the answer to the question "Did trichothecene bother Napoleon?" is, most likely, no.

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12255

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SYNTHESIS OF ACETYLENIC DERIVATIVES OF ALIPHATIC ACIDS

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 2, Mar-Apr 84  
(manuscript received 10 Apr 83) pp 26-28

MAKHSUMOV, A. G. and ERGASHEV, M. S., Tashkent State Medical Institute

[Abstract] The propargyl esters of propionic, isobutyric, valerianic, heptanoic, nonanoic, and undecanoic acids were synthesized and examined for their bactericidal activity. The propionic acid ester was prepared by the reaction of 14.8 gm of propionic acid with 15 gm of propargyl alcohol in 100 ml of benzene with 2 gm of p-toluenesulfonic acid as a catalyst. The reaction vessel was kept at 95-100 C for 4 hrs in a water bath; the pH of the resulting solution was then adjusted with sodium bicarbonate to a weakly alkaline condition and extracted with ethyl ether. The extract was dried over anhydrous sodium sulphate and then the ether was driven off for an 84% yield. The other esters were prepared in similar fashion. All were subjected to infrared and NMR spectroscopy to verify composition. These tests produced the expected absorption regions for the functional radicals in the esters. These esters showed more bactericidal activity against pyogenic, pathogenic and intestinal, infectious microorganisms than known antibiotics. Figures 4; references 5: 4 Russian, 1 Western.  
[275-12672]

## POLYMERS AND POLYMERIZATION

### THERMOSTABLE AND HIGH-STRENGTH POLYMER MATERIALS

Moscow TERMOSTOYKIYE I VYSOKOPROCHNYYE POLIMERNYYE MATERIALY (NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA KHIMIYA) in Russian No 4, Apr 84 pp 2-5, 64

[Annotation, introduction and table of contents from booklet by L. B. Sokolov "Thermostable and High-Strength Polymer Materials" Znaniye, 64 pages, 28,040 copies]

[Text] Annotation

The booklet examines the physical and chemical bases for creating polymer materials with high specifications. It provides information about the qualities and areas of use of Soviet thermostable and high-strength polymer materials based on aromatic polyesters and polyamides (plastics, varnishes, coverings, film, fibers, synthetic paper, and so forth).

The publication is meant for lecturers, instructors, and students of people universities, and for persons who are involved with handling polymer materials.

#### Introduction

Thermostable and high-strength polymer materials are necessary to satisfy the needs of many sectors of modern technology. Modern machines and equipment operate under very intensive conditions--at high speeds and great stresses. Moreover, a trend of increasing intensity is envisioned for the future. This trend is characteristic not only for new sectors of technology, but also for traditional sectors such as automobile building, agricultural machine building, and the production of consumer and medical equipment.

It is clear that the creation of machines and mechanisms operating under these conditions requires new materials capable of withstanding increased temperatures and stress. Besides this, many directions of modern technology involve reducing the overall dimensions and weight of machinery and equipment. As a rule, this leads to high, local, heat build-ups, which again makes it necessary to use materials of greater thermostability. So the creation of polymer materials with improved overall qualities (increased thermostability and high strength) is a main thrust of current chemistry, physics, and polymer technology.

What distinguishes polymer materials from other, "older" materials such as metals, ceramics, and glass, which have high thermostability and are very strong? Polymer materials have a number of advantages over these materials. The main ones are as follows.

Low density. The density of most polymers is no higher than  $1400 \text{ kg/m}^3$ , while aluminum has a density of  $2500 \text{ kg/m}^3$ , lead-- $11,500 \text{ kg/m}^3$ , and glass-- $2300 \text{ kg/m}^3$ . As a result, a machine or piece of equipment made with polymer materials will be significantly lighter. In many cases, aircraft for example, this is very important.

Great elasticity. Polymer materials are better than others at resisting adverse factors often met with in practice, such as impact, repeated twisting, and reversed stresses. In the final analysis, this provides greater durability and reliability of the machine or construction.

The elasticity which polymer materials have is their overall significant feature. It arises because of the special characteristic of polymer molecules' structure--their flexibility.

The elasticity and plasticity of many polymers is retained even at low temperatures. This is especially true for thermostable polymer materials, which, although they are intended for work in high-temperature areas, have advantages over traditional plastics and other materials in low-temperature areas as well.

Wide range of properties. Current polymer technology possesses capacities and techniques which make it possible to vary widely the basic qualities of polymers and give them special properties. For example, we can now produce polymer materials with magnetic and anti-friction qualities. Polymer chemistry and technology can regulate "minute" properties of polymer materials, such as, for example, adhesion and gas permeability.

Possibility of producing a broad variety of materials based on a single polymer. From the identical original polymer (not to mention a class of polymers) it is possible to produce articles which are widely different in form and extremely suitable and convenient for practical application. For example, insulating material can be produced in the form of plates, film, rolls, web, and so forth. In addition, the same polymer can be the basis for construction plastic.

Technological effectiveness. In many cases, it is simpler, more productive, and easier to use polymer materials than any others. Thus, instead of the difficult and lengthy process of producing enamels at high temperatures, it is possible in a number of cases to produce a heat-shielding cover by painting the particle with polymer varnishes under room conditions.

Polymer electrotechnical paper and rolls of synthetic film-board [rulonnyye plenkosintokartony] make possible the automatic assembly of electric motors, while analogous materials based on a fine natural thermostable dielectric--mica--permit only hand assembly.

The use of cast construction plastics makes possible highly productive manufacture of Soviet articles in large series, exactly "to scale," and often without hand finishing.

Of course, polymer materials, too, have shortcomings. But thanks to the advantages described, polymers are widely used in very different fields.

With the development of the chemistry of high-molecular compounds, previously unknown polymers are being created. Some important examples of new polymers are thermostable cyclo-chain [tsiklotsepnnye] polymers, which often serve as the basis for creating high-strength materials. In the booklet, we take a thorough look at materials produced on the base of two classes of polymers--aromatic polyesters (polyarylates) and aromatic polyamides. In our view, they are especially promising for development, since they are obtained from easily available raw materials and by comparatively simple technology. In addition, their production provides a sufficiently good example of current approaches to creating polymer materials with high specifications.

From the great array of problems connected with thermostable and high-strength polymer materials, we isolate the following main problems:

From which polymers can we produce materials with high specifications?

Which methods can be used to obtain various polymer materials from suitable polymers?

What are the properties and areas of application of new Soviet polymer materials with improved qualities?

We attempt to give answers to these and certain related questions.

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12255

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## FROM DISCOVERY TO INTRODUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 Mar 84 p 2

[Article by G. Sidorova]

[Text] Yesterday, in the USSR State Register under number 288 a new discovery was entered: "Law of solid-phase polymerization of organic substances (monomers) under conditions of shift deformation and high pressure." Its authors are N. Yenikolopov, academician; A. Zharov, doctor of chemical sciences, and V. Kapustyan, candidate of chemical sciences.

"Would you like to see how polymers are made?" asked A. Zharov, when I went to his laboratory at the USSR Academy of Sciences' Institute of Organic Chemistry imeni N. D. Zelinskiy.

"Of course."

The scientist opened a little jar with white powder. He explained: "This substance is close to naphthalene. Under usual conditions it is very difficult to get a polymer from it." He sprinkled a little powder on one of two metal heads, clamped the other from above and locked them into the apparatus. He closed the press. The arrow on the manometer showed pressure to 50,000 atmospheres. And then the most important thing occurred--the heads were turned relative to each other by almost 360 degrees. This was the displacement. A. Zharov withdrew the heads and removed the upper one. On the lower one was a fine coating, dark brown in color--the polymer just obtained.

Polymer chemistry began its stormy development 50 years ago. But until now it was considered unpromising to carry out polymerization in a solid state. Therefore, in order to form polymers from solid substances, they were usually dissolved in special solvents or melted. But this has made production much more complicated and expensive.

But don't conditions exist under which substances are polymerized in the solid phase? The Soviet scientists asked themselves this question. And they found

these conditions: it is necessary not only to compress the substance, but to turn it. In this case, the speed of the processes increases by millions and sometimes even billions of times in comparison with traditional technology. But most important are the laws established for reactions for formation of polymers, which are applicable also to other chemical processes.

The discovery by the Soviet scientists laid the foundations for a new branch of science—deformation processes chemistry, which studies chemical conversions which arise during the deformation of solid substances. The theory of the new direction in chemistry is successfully being developed by scientists at the Chemical Physics Institute and the Organic Chemistry Institute imeni N. D. Zelinskiy.

The discovery has not only scientific but also serious practical significance. Academician Yenikolopov, on the basis of the fundamental research results, succeeded in solving a number of important economic problems.

"An eternal problem is where to dispose of rubber wastes," N. Yenikolopov said. "The rubber does not dissolve and does not melt. Burn it? First of all, it is harmful to the environment. Secondly, it is too wasteful to destroy hundreds of thousands of tons of excellent secondary raw material. Studying how properties of a substance change under the influence of shift deformation, we discovered that organic and nonorganic polymers are capable under these conditions of being pulverized. On the basis of this effect, an elastic deformation method for pulverizing rubber wastes which then are used as admixtures during the preparation of new articles was developed. New production process lines are already operating in the First Moscow Plant for Rubberized Articles and in the Balakovo Rubber Technology Association..

The scientists discovered also that under the influence of shift deformation the nourishing properties of certain types of crude feed, for example, bran and straw, are improved. Even sawdust may become suitable for animal feed after appropriate treatment. "Together with the Institute for Physiology, Biochemistry and Feed of Livestock of the Academy of Agricultural Sciences imeni V. I. Lenin," continued Nikolay Sergeyevich, "we tried a new technology for treating the straw. The use of this feed may substitute for 15 percent of the grain (and this is millions of tons) which is used as cattle feed."

The new discovery has produced lavish practical results. But the scientists are certain that the chemistry of deformation processes has just begun to disclose its possibilities.

12318  
CSO: 1841/220

## SOVIET VERSUS FOREIGN TECHNOLOGY

Moscow IZVESTIYA in Russian 21 May 84 p 2

[Interview with Nikolay Sergeyevich Yenikolopov by staff writer B. Kononov:  
"The Purpose of the Sciences: Foresight and Benefit"]

[Text] "Now, when our party has established the goal of the transition of the country on the path of intensive development, it is necessary that such ruble which is allocated to the expansion of industry be used zealously, that all alternate solutions are analyzed from all sides and the most economic and progressive ones are chosen,"--thus begins the conversation with Academician Nikolay Sergeyevich Yenikolopov. He is a famous specialist in the field of polymer chemistry, a Lenin prize laureate, is responsible for several important discoveries on the basis of which a series of functioning industries with advanced technology have been created and new factories have been built.

"At conferences on the development of polymer chemistry," says Academician Yenikolopov, "it is now often heard that 'our salvation is in the unit capacity of reactors.' In principle, of course, this is correct. The advantages of plant capacities have been known for a long time. The higher the capacity of the reactors, the smaller the capital investment and the production cost of a ton of product. But this is only up to a specific rational limit. In many industries we have already reached it. In polymer chemistry, there are already reactors which can produce, for example, 70,000 tons of polyethylene per year at one site. These are gigantic installations. When they are transported, newspapers write about this event, television follows after it, roads and bridges are specially reinforced. What will be next? Will special roads be laid down for larger reactors and new bridges and tunnels built?

We don't need a simple arithmetical expansion of single plant capacity, but a different kind, the growth of the production of products from a unit of volume of reactors. This is the major goal. And it can often be reached, without resorting to gigantomania."

[Question] What hinders such an approach, why do you see a panacea for all troubles in the giant installations?

[Answer] There are many reasons. The main one is that expansion of the sizes of installations is simpler than the search for principally new solutions. This already demands another science, more contemporary technology and, mainly, in my view, a different organization of the whole chain from the birth of an idea to production.

Now you frequently see that chemical science in essence is separate from technology. Some scientists think that a reaction in a flask, an article in a journal, is science. And, further, so is the business of engineers, of branch organizations.

Such scientists forget for what purpose we develop chemical science. For the sake of articles? No, in the final analysis we want to have an actual product. But will this really happen if we tear apart the chain of scientific research in essence halfway? Is it really possible to consider technology another part of research? A good technologist now must be an excellent chemist, physicist, mathematician and a specialist in many other fields of knowledge. The engineer from time to time is simply not in a position to solve those fundamentally new problems which science places before him. In order to move advanced work forward into operation more quickly, a deeper scientific-technical processing of such work is now necessary until it is transferred into industry.

Today, if we want to have an advanced chemical industry, it is necessary to strengthen experimental production in all ways possible, where it would be possible to create contemporary technology. But now, in the Academy of Sciences system, for example in polymer chemistry, there is not one experimental production center. And it turns out, that if new work, completed in the Academy of Sciences, is directed to improve the existing technology, then branch institutes may be interested in it. And if something basically new is born, then it comes into operation painfully and for a long time.

Of course, it is impossible to say that academy science is divorced from industry. Many examples of fruitful cooperation in different fields are known. But the output, in my view, could be much higher. It is already time for us to have a clear system for the rapid introduction of pioneering works into operation which have important practical significance. In accordance with the theme mentioned in the recent decree of the CPSU Central Committee and the USSR Council of Ministers "Concerning measures for the acceleration of scientific-technical progress in the economy", the Academy of Sciences, where the most qualified forces of scholars are concentrated, must have an experimental-production link for the creation of principally-new progressive technologies and materials.

There was a time, when a scholar could tranquilly occupy himself with pure science: he has discovered something--ten years later the technologist has used it. But we don't have these ten year periods now. The valuable discoveries of chemists in the whole world go, as they say, from the wheels into practice; the gap between fundamental and applied research is practically nonexistent. Moreover, the needs of industry more frequently form the directions of fundamental scientific research. Such a technological process exists under very high pressure, temperatures, demands much energy, materials for its operation; scientists deliberately and intensively conduct the search for a simpler and more economic solution. Before our eyes the process of the joining of fundamental and technological sciences is taking place. This is one of the most important phenomena of the scientific-technological revolution.

The great Russian chemist Dmitriy Ivanovich Mendeleev said that the "purpose of sciences is foresight and benefit." We today must be occupied first and foremost with those processes, reactions, technologies--in a word, that

chemistry which is vitally necessary for the country. Now already several tens of millions of chemical reactions are known. The study of the mechanism of each of these could last a lifetime. And if one does not look to the use of this research, then this will be the classic case of the satisfaction of personal curiosity at the expense of the state. In each field there is a rational limit to the detail of research. At a specific level of theoretical presentations, experimental methods, apparatus, only a specific level of results may be squeezed out. To dig further in such "ground" is senseless. Here already only a personal harvest will grow, but not a societal one.

The USSR State Committee for Science and Technology recently closed a number of branch institutes and laboratories. And this was correct because the closing of the old often opens the road to the new.

At the same time one may see this sort of picture: an institute of laboratory has been occupied for a long time with some process or other, and in the final analysis purchased the technology abroad. But the quantity of personnel of the institute is not reduced! You ask the manager: why do you need so many people here? And usually you hear the response considerations quite distant from state considerations.

[Question] It turns out that the number of our chemists and institutes is constantly increasing but factories, at the same time, are built with foreign technology. To imitate advanced technological ideas is not shameful. But, it would seem, if some institute had been developing its own technology, whereas preference has been given to foreign technology, then it is necessary to draw organizational conclusions. Why, in your view, doesn't this take place?

[Answer] Here there is not a simple situation. The acquisition of foreign technology does not always signify a lower level of work of our scientists. Often this is their problem, but not their fault. It happens, that we have our own development, better than foreign, and nevertheless it is neglected.

Recently we had to create powerful production of a reagent for the conservation of silage, and in the long run significantly increase it. Here we have our own good native process of production for this product. But the director of the factory, to whom business is entrusted, with all his strength insists that we buy foreign technology. He had his own logic. For native technology it is necessary to design production, build buildings, order equipment, and work it out so that all things take place on time and are set up. He has a large factory in operation which demands constant attention. A contract with a foreign firm frees the director from much trouble; the chief worry is to keep track that the contractual conditions are strictly carried out. And that for which currency is spent is cutting up the entire direction of native science--this is already in the foreign section.

Such shortsightedness is dangerous in another way because the capitalists try to sell not the latest technology, and furthermore, the sort of technology which needs constant provision of the firm's catalysts, reagents, equipment. Knowing that it is complicated to establish a functioning industry, from time to time for various reasons they shamelessly raise prices for their reagents and spare parts.

It is at this point that the ministry remembers that it does have a branch institute which handles this process, and begins to "push" the scientists. You mean you can't make your own that is better than the foreign one? And the institute, instead of principally-new projects, begins to "mend holes", and does that what has already been done 10-15 years ago abroad. This is one of the important reasons on the strength of which, having bought the foreign technology, the ministries do not reduce the number of institutes that are busy with analogous subjects.

In my opinion there is only one exit from this vicious circle: don't buy foreign technology if good native technology exists, or at least do not acquire technology that makes us dependent on foreign reagents and spare parts.

[Question] But the acquisition of foreign technology is often a necessary measure. Don't you relieve those scientists of responsibility whom we have forced into this.

[Answer] Scientists, of course, also bear responsibility; I did not intend to justify them. Now, in my view, the monopoly position of the head institutes hinders the rapid development of native chemistry. On the one hand, the creation of head institutes, like the blessing of the ministry, the planning organs, know who is responsible for this or that subject, to whom the job is entrusted; everybody knows where to turn to answer a given question. But let's look at the other side of the coin. There are in fact no competitors for the head organization. Whatever they do will be fine. But if someone on the side immediately manages to something in their "territory", then as practice shows, this frequently turns out "badly."

I'll give one example. Recently in an article "Don't Throw Away Old Galoshes" in IZVESTIYA, they told about a new technology which allows the efficient and economic pulverization of old resin or industrial waste and reuse of the resin powder obtained. Work in this area was conducted long ago; there are different methods of pulverization and numerous prescriptions of the impurities of the byproduct in the new products. Our technology makes it possible to pulverize to very small particles with little waste of energy.

The Production Association "Balakovorezinotekhnika" grabbed this technology with enthusiasm. But the factory could use it only in accordance with temporary technical conditions, as an experiment. In order to include it in the permanent technological chain, the agreement of the chief organization--the Scientific Research Institute of Resin Industry of the USSR Ministry of Petroleum Processing and Petroleum Chemistry Industry is necessary. And they would not allow it. When I approached the Deputy Minister of Neftekhimprom (USSR Petroleum Chemistry Industry) M. P. Parfenov, he frankly revealed to me: "We don't need your method; we will develop our own." Why? I ask? Do we really live in different countries?

[Question] Nikolay Sergeyevich, you are in fact, Director of the Institute of Synthetic Polymer Materials of the USSR Academy of Sciences, the chairman of the scientific council for synthetic materials of the USSR Academy of Sciences Presidium, finally, the chairman of the council for the application of polymers in the economy of the USSR State Committee on Science and Technology. Does your authority really not suffice to change the position of the head institute?

[Answer] I imagine it's not enough. But imagine how much harder it is for people without degrees and titles, who are putting forth competing suggestions, to beat their heads against the wall of head organizations. Unfortunately, the existing councils may only advise. But the right to decide is given to the Ministry and the head organization. Without the agreement of the scientific council, in principle one may decide what one pleases, but here without the agreement of the head organization not one chemical process can be put into serial production.

Therefore the monopoly of the industrial sectors' head institutes more and more reveal their negative side. In the nation they do not have any genuine critic, rival. In such a situation we will recognize the poor work of the head institute only when foreign competition moves far ahead of us.

[Question] What do you suggest?

[Answer] It is necessary to think how to remove these negative phenomena. In my view, the ministries must have expert councils of famous scientists who are capable of objectively evaluating the level of work of the head organizations and deliver a veto if they try to impose on the country inappropriate, obsolete technology.

But the chief thing, I believe, is that we must radically reconstruct the design business. It is more advantageous to us to advertise competition for large projects than to render a monopoly right to someone for design. Contemporary production occasionally costs billions. And a certain increase of expenditures in the system of competition projects may economize huge resources, in spite of the appreciation of the design process. In a monopoly situation, it is simpler for the chief institutes to renovate the old and pass it off as new rather than search for fundamentally different, more efficient solutions.

Until the end of the century we are faced with the significant increase in strength of the chemical industry and the state is far from being indifferent concerning what ways the growth of industry will take. Now, analyzing the signs of the future, you see each ton of separate types of products in industry will often expend more energy and raw materials than today.

It means that, in the future, a ton of product in the new factories must be more expensive than in today's factories. This contradicts common sense! Yes, now ecological measures are expanding, raw materials are more expensive, but still scientific-technical process goes forward. And if, planning the future, we make uneconomical decisions, it means that in essence they ignore the achievements of science and technology. This is inexcusable. The future must be built on the basis of scientific-technical progress. If the existing system of scientific research and design hinders this, then it is necessary to change it. The party has set the goal for the intensification of the economy. And chemistry cannot stand on the sidelines of this main track of the country's development.

12596  
CSO: 1841/282

## MINSK BEARING PLANT DEVELOPS USE OF PLASTIC

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 3, Mar 84 pp 40-41

[Article by N. Simkhovich, head of the GPZ-11 plastics laboratory: "Plastic Is Working"]

[Text] Every year the Minsk Bearing Plant [GPZ-11] uses more than 100,000 tons of steel and nonferrous metals. Thus, one percent of its economy amounts to neither more nor less than 1000 tons. The collective of the enterprise is perfecting the processing technology and the design of bearings, applying the economic profiles of rolled goods, and assimilating the production of high-precision blanks [zagotovki]. The personnel collective of the plastics laboratory is also making its contribution to the overall economy.

The first steps towards practical use of polymers for the needs of basic production were taken in 1963. At that time, Chief Metallurgist L. Kosachevskiy instructed me to take on this problem. First, rationalizers prepared a simple casting machine, on which we used waste products to cast kapron parts: various sleeves, collars, and gaskets. Gradually we acquired experience, and interest in the new endeavor appeared. Soon came the idea of manufacturing a part such as a bearing cage [separator] from polymers. Ordinarily, brass, steel, or aluminum was used for this. It was not simple to turn away from the traditional technology, which was in use throughout the industrial sector, and decide on this substitution.

For a long time we deliberated about which bearing to begin with. Life itself dictated the decision. The enterprise ran into grave difficulties in manufacturing the bearing cage for the steering transmission of the MAZ automobile. The problem was that its design was fairly complex, making it accordingly more difficult to manufacture the dies. It was this bearing that we chose for the first experiments. We decided to make the cage by casting under pressure, using polyamides. Engineers V. Yesenovich, Z. Livshits, and V. Rybakova developed the necessary design and casting form.

The new cage met all the basic geometric requirements. Testing brought good results. But here was the snag: the innovation was making the machine builders suspicious. It took several years before the first bearing with a plastic cage was established in the MAZ steering transmission.



Sometimes it is difficult to estimate the damage done by a poor-quality bearing. It can cause the destruction of complex assemblies, and force equipment and transport to be stopped. So the optimal choice of material and design has great importance. In assimilating needle-shaped collarless bearings for the Zhiguli automobile, cages were first made from brass or steel. It turned out that these did not provide the necessary traveling life. The plant's specialists faced this task: find a new material which would be more reliable than metal. This problem was undertaken by a group consisting of Deputy Chief Engineer V. Koshel' (the leader), Chief Designer E. Kuznetsov, Chief Metallurgist D. Shevchak, and engineers V. Yesenovich, Ye. Rud'ko, and G. Filipchik. They engineered a design for the cage and casting form. We technologists, for our part, led the search for a polymer which would fully meet the increased requirements. As a result of painstaking research, we arrived at the conclusion that the best material to replace the metal would be the glass-filled polyamide PA66KS. After laboratory and bench testing, the bearings were sent to Tolyatti, to the Volzhsk Auto Plant. Naturally, we waited impatiently for a reply from the automobile builders. And then, finally, it came. Specialists of the plant reported that the durability of transmissions with our bearings was significantly better. This was a victory.

In order to start series production of polyamide cages, our enterprise installed casting facilities, where automatic thermoplastic equipment was placed. This required qualified repairmen and foundry men like I. Mikhail'kevich and A. Krumin. From this type of cage alone, the economic effect was more than 70,000 rubles. The 28 operations necessary to manufacture parts from metal were reduced to one--pressure casting. Instead of 32 men, a total of three was enough.

After this, the plant boldly began replacing metal with plastics. Today almost all domestic automobiles operate on bearings with polymer cages.

Like any new undertaking, its assimilation required a creative approach and initiative from workers, technologists, designers, and production managers. A. Potapov, the head of the needle bearing shop, was one of the first to understand the advantages of the new technology. It was largely due to his persistence that the bearing with the plastic cage was adopted for textile equipment. A great effect was also obtained by replacing aluminum cages with plastic ones in bearings for the automobiles of the Kamsk Auto Plant.

Foundryman Ye. Romashevskiy holds authority and respect in the collective. At the plant he joined the CPSU, mastered a number of related occupations and became a first-class specialist. All of the new plastic parts passed through his hands. This leading foundryman willingly passes on his rich experience to young workers. V. Andreychikov, a graduate of the Belorussian Polytechnic Institute, came to the enterprise a little over two years ago. During this time, he has shown himself to be a qualified engineer who knows his business.

Since bearings with plastic parts have an ever-expanding market, three years ago a section was converted into a plastics laboratory in the division of the chief metallurgist. At the start of the 11th Five-Year Plan, the laboratory's collective, in collaboration with other services and subdivisions of the plant, managed to save more than 500 tons of metal, significantly reduce labor costs, and improve the quality of the product.

Our plant, which was the first in the industrial sector to use plastics to manufacture such domestic parts, has become a unique school of advanced experience. Colleagues from related enterprises come to us for advice and consultation. The most difficult question is correctly determining for which types of bearing it is worthwhile to use plastic. Of course, we conceal nothing, trying to explain all the particulars of the new technology and prevent possible mistakes.

Now we have undertaken resolution of yet another task: we are trying to replace brass with plastic in the cages of heavy-stress, double-row roller bearings. These are installed in the axles of railroad cars, hoisting mechanisms, and machines for the mining industry. Replacing brass with plastic will make it possible to increase the life of these bearings and save more than 2000 tons of scarce metal. Jointly with specialists of the Minsk branch of the All-Union Scientific-Research Institute of the Bearing Industry, we have already developed a design for the casting form of the double-row roller bearing. The laboratory has prepared experimental batches of plastic cages, which have been sent for testing. If we succeed in the slated program, we will get a two-fold effect: first, the savings of brass; second, the same quality product will be produced with lower labor costs and in a smaller production area.

The use of polymers has proved worthwhile not just in basic production. In the shop, the casting section is producing goods for wide consumption. We had previously studied similar production set up in the Borisov and Minsk Plastic Articles plants, and at "Termoplast."

Last year measures adopted by the efforts of laboratory workers yielded an economic effect totaling 61,900 rubles. We believe that in the future, the results produced from our developments will be even greater.

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#### PROLONGED DURABILITY OF POLYOLEFIN THERMOELASTOPLASTICS

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 5, May 84 pp 66-71

ALIGULIYEV, R. M., KHITEYEVA, D. M., IVANOVA, A. Kh., KERIMOVA, F. I. and KHALILOV, Kh. S., Azerbaijan Medical Institute imeni N. Narimanov

[Abstract] New products of combined polymers have recently received considerable attention. The present article reports on study of thermoelastoplastics based on compositions of high-pressure polyethylene and ethylene-propylene-diene elastomers with the third components of ethylidenenorbornene (SKEPT-E) and dicyclopentadiene (SKEPT-D). After polymerization, the materials were tested at 243-353 K. Results showed that while the products did not differ in longevity, they had different critical stress values and athermal failure mechanisms. Their behavior at positive and negative temperature also differed, leading the authors to conduct structural tests by infra-red spectral analysis, differential thermal analysis, X-ray and electron-microscopic methods. While the temperature range was shown to have direct bearing on longevity and durability, the conclusions for specific thermoelastoplastics are regarded to be only provisional, and more tests are being conducted. Figures 2; references 12 (Russian).

[288-12131]

UDC 665.614

#### USE OF $C_8$ FRACTION OF LIQUID PYROLYSIS PRODUCTS

Baku AZERBAYDZHANSKIY KHIMICHESKIY ZHURNAL in Russian No 5, May 84 pp 30-33

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[Abstract] Liquid products of pyrolysis typically contain 9-18% by weight of the  $C_8$  aromatic fraction, which has been utilized by complex industrial procedures to produce ethyl benzene or benzene, as well as styrene. Growing needs for the latter led the present authors to test a simpler, direct extraction method. Pyrolyzed benzene of the ethylene plant at Burgas, Bulgaria, with boiling point range of 50-192°C, 0.023% sulfur by weight, 6.8% by weight diolefins, 51.4%  $C_6$ - $C_8$  aromatic hydrocarbons and 4.1% styrene, was extracted in a rectification column at 50-120°C at atmospheric pressure, followed by vacuum

extraction at 120-153°C. Results showed that 99.8% of the styrene was extracted in the range of 123-153°C, while 93.3% was extracted at 132-153°C. The styrene had low sulfur content and moderate bromine numbers. Antipolymerization experiments identified butylpyrocatechin as the best substance to prevent polymerization during processing, while caprolactam N-methyl-ε was the best separating agent. The direct extraction method resulted in significant reduction of styrene losses. Figure 1; references 4 (Russian). [288-12131]

UDC 541.64:547.583:536.7

THERMODYNAMICS OF p-METHACRYLOYLOXYBENZOIC ACID, ITS POLYMERIZATION AND FORMATION OF POLY-p-METHACRYLOYLOXYBENZOIC ACID AT 0-500°K

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84 (manuscript received 15 Aug 82) pp 909-914

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[Abstract] Calorimetric studies were conducted on the thermodynamic parameters of p-methacryloyloxybenzoic acid (I) and its polymerization into poly-I (II) at 0-500°K under standard pressure. Tabular data summarize the results of the determinations of  $C_p^0$ ,  $H^0(T)-H^0(O)$ ,  $S^0(T)$ , and  $G^0(T)-H^0(O)$  for I and II in the 0-330°K range, and the  $\Delta H_c^0$ ,  $\Delta H_f^0$ ,  $\Delta S_f^0$  and  $\Delta G_f^0$  at 298.15°K and  $p = 101.325$  kPa (respectively 4960.6 and 5017.3, 798 and 854, 610 and 660, and 628 and 651 kJ/mole for I and II). Thermodynamic parameters for the polymerization of I into II at  $p = 101.35$  kPa were  $-\Delta H_f^0$ : 55-59 kJ/mole at 0-298.15°K, 90 kJ/mole at 500°K;  $-\Delta S_f^0$ : -15 to 8 kJ/mole at 0 to 298.15°K, 85 kJ/mole at 500°K; and  $-\Delta G_f^0$ : 54-56 kJ/mole at 0 to 298.15°K and 34 kJ/mole at 500°K. On the basis of these data, the upper limit of polymerization was calculated as 1060°K, which greatly exceeds the temperature of thermal destruction of I and II. Figures 2; references 14: 8 Russian, 6 Western. [283-12172]

## SYNTHESIS AND EVALUATION OF ANION-ACTIVE POLYURETHANES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 20 Jul 82) pp 932-938

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[Abstract] Description is provided of the preparation of anion-active polyurethanes as aqueous dispersions, using a phase inversion approach for the condensation of prepolymers with isocyanate end groups and bifunctional hydrazine derivatives, and linking with pyrometallic dianhydride. The prepolymers were obtained by the reaction of polyoxytetramethylene glycol, polyoxypropylene glycol, or polyethylene glycol adipate with 1,6-hexamethylenediisocyanate at 80°C for 2 h. IR spectroscopy and determination of ionomer properties showed the formation of stable films with anion-active sites. Use of 4,4'-diphenylmethanediisocyanate or toluylenediisocyanate failed to give aqueous dispersions since the polymers precipitated due to rigidity of the macromolecular structure. All of the tested hydrazine derivatives yielded highly elastic and stable films which exceeded the elasticity and stability obtained when ethylenediamine was used. Figures 3; references 4: 2 Russian, 2 Western.  
[283-12172]

## SYNTHESIS AND STRUCTURE OF ALTERNATING ISOPRENE ETHYLENE COPOLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 27 Jul 82) pp 954-961

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[Abstract] Details are presented on the synthesis of copolymers with alternating isoprene-ethylene monomers employing  $\text{TiCl}_4\text{-CH}_3\text{COC}_6\text{H}_5\text{-(iso-C}_4\text{H}_9)_3\text{Al}$  as the catalytic system.  $^{13}\text{C}$  and  $^1\text{H}$  NMR spectroscopies demonstrated that copolymerization under the conditions described yielded copolymers containing 88-93%  $\text{C}_2\text{-C}_5$  diads, in which the isoprene monomers are represented largely by 1,4-cis- (55-56%) and 3,4- (39-44%) monomers, with a lesser amount accounted for by the 1,4-trans- (1-6%) links. In addition, the copolymer contains 7-12% ethylene block sequences. Isoprene block sequences were apparently not formed. Increasing the initial  $\text{C}_5\text{:C}_2$  ratio from 1 to 4, as well as the Al:Ti ratio from 5 to 15, favored formation of the alternating copolymer over polyethylene formation. Figures 2, references 14: 4 Russian, 10 Western.  
[283-12172]

## ENHANCED THERMAL STABILITY OF RIGID POLYIMIDES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 9 Aug 82) pp 981-988

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[Abstract] Thermomechanical studies were conducted to determine thermal aging and damage of various rigid polyimide films designated as DF-DFE, DFO, PM, DFO-B, DF-B and DF-pF [sic] in the temperature range of 275 to 500°C in air. Polyimides lacking a hinge heteroatom in the chain retain their mechanical properties for a longer period of time at the higher temperatures than do the flexible molecules. Evaluation of the aging kinetics at high temperatures in relation to chemical structure indicated that the greater thermal stability of the rigid polyimides is due to both a greater degree of conjugation and the cage effect. An exception to this general rule is represented by DFO-B with a melting temperature above 500°C and an intermediate thermal stability. DFO-B contains a hinge oxygen atom in the dianhydride component that perturbs the conjugate system and lowers its thermal stability. Figures 3; references 13: 10 Russian, 3 Western.  
[283-12172]

## GROWTH-LIMITING REACTIONS IN ETHYLENE POLYMERIZATION ON SUPPORTED ORGANO-METALLIC CATALYSTS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 14 Aug 82) pp 993-997

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[Abstract] The nature of growth-limiting reactions was determined in ethylene polymerization on silica gel-supported organometallic catalysts, employing the method described by Zakharov and Yermakov [J. POLYMER SCI., A-1, No 11: 3129 (1971)]. Studies using the organometallic and tetrahydroborate systems demonstrated that in most cases ( $\text{SiO}_2\text{-Zr}(\text{C}_3\text{H}_5)_3\text{Br}$ ,  $\text{SiO}_2\text{-BCl}_3\text{-Zr}(\text{C}_3\text{H}_5)_4$ ,  $\text{SiO}_2\text{-Zr}(\text{CH}_2\text{C}_6\text{H}_5)_2\text{Cl}_2$ ,  $\text{SiO}_2\text{-TiCl}_4\text{-Zr}(\text{BH}_4)_4$ ,  $\text{SiO}_2\text{-(Zr}(\text{BH}_4)_3\text{I)}$ ) the predominant reaction limiting elongation consists of chain transfer to monomeric units, especially in the case of systems forming low MW polymers. Both low monomer concentration and higher temperatures favor such a spontaneous transfer. The ratio of the transfer reaction rate to the rate of chain elongation appears to be determined by the interrelationship of the structurally-different  $\pi$ -complexes. Figures 2; references 15: 5 Russian, 10 Western.  
[283-12172]

## EFFECTS OF METHOD OF PREPARATION OF POLYMERS ON IONIZING RADIATION-INDUCED ELECTRICAL CONDUCTIVITY

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 30 Aug 82) pp 1003-1008

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[Abstract] A study was made of the relationship between the density of PS [polystyrene] prepared by evaporation from various solvents (toluene, ethyl acetate, methylethylketone) and ionizing radiation-induced electrical conductivity. The amorphous PS were irradiated by Co-60 gamma radiation. Analysis of the data showed that the higher the temperature of evaporation, i.e., the higher the rate of diffusion of solvent molecules, the higher was the resultant electrical conductivity in comparison with PS films prepared at room temperature. An analogous effect was obtained with the less concentrated solutions, but the relationship was less pronounced since the macromolecules show greater mobility and the effects of temperature on their mobility is attenuated. The key factor in the formation of free spaces that affect the progression of radiation-induced charge carriers appears to be the rate at which solvent molecules are removed in relation to the rate of relaxation processes. At the higher temperatures more homogeneous films are formed with less free spaces and, consequently, higher density values. Figures 3; references 10: 7 Russian, 3 Western.  
[283-12172]

## RADIATION-INDUCED LIQUID-PHASE GRAFTING OF ACRYLIC ACID TO POLYETHYLENE FILMS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 7 Sep 82) pp 1013-1019

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[Abstract] Studies were conducted on the factors affecting the outcome of radiation-induced liquid-phase grafting of acrylic acid to 90 and 250  $\mu\text{m}$  thick polyethylene films, in relation to the dose of gamma irradiation, acrylic acid concentration, and toluene concentration. The experimental conditions selected could be used to control the cross-sectional degree of grafting and in modifying the thermomechanical and stretch characteristics of the films. Simply altering the concentration of the monomer was sufficient to secure graft copolymers with the desired characteristics, with low acrylic acid concentrations yielding homogeneous distribution of the grafted monomers on the polyethylene. Figures 5; references 10: 9 Russian, 1 Western.  
[283-12172]

## GLASSY TRANSITION IN HETEROGENEOUS POLYMERIC SYSTEMS WITH HIGH DEGREE OF PHASE SEPARATION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 8 Sep 82) pp 1029-1032

LIPATOV, Yu. S., ROSOVITSKIY, V. F. and MASLAK, Yu. V., Institute of Chemistry of High Molecular Weight Compounds, Ukrainian SSR Academy of Sciences

[Abstract] Studies were conducted on the viscoelastic properties of polymer networks synthesized by condensation of oligoisoprenedihydrazide with epoxide oligomer ED-16 by a previously described method. Measurement of several viscoelastic properties in the temperature range 113-423°K led to determination of the minimum dimensions (6-7 nm) of structural heterogeneity for which glass transition can be established. Evidently, microphasic separation of the components proceeds concomitantly with lattice formation. The overlap in glassy transition of each component with similar processes in the interphase layers leads to the appearance of a single overall glassy transition process. Figures 2; references 12: 8 Russian, 4 Western.  
[283-12172]

## REVERSIBLE RADIATION EFFECTS IN POLYMER HEAT CAPACITY

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 1 Oct 82) pp 1047-1052

BRISKMAN, B. A., ROZMAN, S. I. and VAISBERG, S. E., (deceased), Scientific Research Physicochemical Institute imeni L. Ya. Karpov

[Abstract] A theoretical analysis was conducted on radiation-induced reversible changes in the heat capacities of several polymers, related to the thermodynamics of radiolytic gas release. In the case of polyethylene, such effects were found to be at a minimum. Similarly, a reversible change in heat capacity was not found in the case of a silicon-organic resin. However, significant reversible effects were evident in polyvinylformal with an anomalously high release of radiolytic gases (CO, G = 20-22 moles/100 eV) following Co-60 gamma-irradiation, attributed to breakdown of the acetal ring. Figures 5; references 7 (Russian).  
[283-12172]



## BROMINATED POLYPHENYLENEOXIDES: THERMAL DESTRUCTION AND FIRE RETARDANTS IN POLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 11 Oct 82) pp 1060-1067

GITINA, R. M., OKSENT'YEVICH, L. A., KUZNETSOV, A. A., DANILINA, L. I., IZYUMNIKOV, A. L., ROGOZHINA, Ye. D., BOGACHEV, Yu. S., KOPYLOV, V. V. (deceased), NOVIKOV, S. N. and PRAVEDNIKOV, A. N., Scientific Research Physicochemical Institute imeni L. Ya. Karpov

[Abstract] Several brominated polyphenyleneoxides (BPPO) were studied for their behavior during thermal destruction and function as fire retardants in different polymers, in relation to their structural features and location of the bromine atom. The BPPO molecules were found to differ significantly in relation to destruction by combustion and the location of bromomethyl groups, in comparison with unsubstituted molecules, which consisted of both chain breakage and Br elimination. All of the BPPO molecules tested functioned as fire retardants in polyethylene and polystyrene. The effectiveness of BPPO in polyethylene was related to the thermal properties of BPPO, whereas in polystyrene such a relationship was not apparent. The advantages of BPPO as fire retardant in polymers is predicated on the greater stability of BPPO and less bleeding in comparison with low MW retardants. Figures 5; references 15: 4 Russian, 11 Western.  
[283-12172]

## DEFORMATION THERMODYNAMICS OF POLYDIMETHYLSILOXANE COPOLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 5, May 84  
(manuscript received 12 Oct 82) pp 1077-1082

TARASOV, S. G., YAKIMTSOV, V. P., KOVRIGA, O. V. and GODOVSKIY, Yu. K., Scientific Research Physicochemical Institute imeni L. Ya. Karpov

[Abstract] Block and graft copolymers of polydimethylsiloxane with arylate were subjected to thermomechanical stresses to determine the effects of the rigid phase in such elastomers. A number of equations were derived to explain the energy characteristics of deformation in the different copolymers using calorimetry, with the energy factors demonstrated to be dependent on the content of the glassy component. Since active fillers had a significant effect on the energy component of deformation, it appears that intermolecular energy changes play a significant role in deformation mechanisms in the case of elastomers with fillers and elastomeric graft and block copolymers. Figures 6; references 13: 11 Russian, 2 Western.  
[283-12172]

## SURFACE DESTRUCTION OF EPOXY POLYMERS BY MICROORGANISMS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 84 pp 26-27

ZAYTSEV, Yu. S., BOBROV, O. G., STROGANOV, V. F., SHOLOGON, I. M. and KUNIN, V. I.

[Abstract] Surface destruction was quantitatively examined as a first step in investigating biological destruction mechanisms in polymers. Plates of 2-mm thick epoxy polymers 30x30 cm were prepared by pouring low-polymer epoxy into steel molds treated with an antibinding agent. Low-polymer test samples included epoxy-diane hardened at 120-200 C with anhydrides such as isomethyl-tetrahydrophthalic anhydride and modified epoxy-dianes set with polyanhydrides or with Lewis acids. Samples were held in aeration tanks for 60 days with 2-3 gm/l (dry wt) of saprophytic bacteria and fungi. The intensity of biologic activity was measured by oxygen uptake and changes in phosphorus and nitrogen levels. Surface destruction was measured by visual indications of microorganism growth and also spectrophotometrically by changes in light reflection and transmission. These changes varied with time, initially following a logarithmic curve as the microorganisms multiply, then fell, presumably as metabolic byproducts increased, particularly carboxylic acids. Variations between samples indicated dissimilar biologic mechanisms for the different compositions. Surface examination with an electron microscope was only useful when unexposed samples had first been treated to provide a statistically-even morphological structure. This preliminary analysis indicated that aeration tanks can provide a standard test approach with high reproducibility of results. References 7 (Russian).

[269-12672]

## EPOXIDE POWDER COMPOSITION MATERIALS FOR COATINGS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 84 pp 24-26

VOLOSHKIN, A. F., LOMOV, Yu. M., PRUDKAY, P. A., SHRAM, G. I., POPOVA, L. P. and KAPITANOV, V. M.

[Abstract] Various epoxide powder compositions were examined for the properties of the coatings they produce, their temperature sensitivities and their shelf lives. Resin E-49 is the most adaptable basic material, but its use requires temperatures of 150 C or higher and its viscosity tends to vary widely from batch to batch. This is directly related to the desired fluidity, so batches may have to be selected by viscosity. With dicyandiamide as a hardener, it provides composition powder EP-49D/1, stable for 6 months storage and hardening in 3-6 hours at 150-200 C. With hexamethylenetetramine added to the hardener, the time can be halved. Composition powder EP-49SP uses only the hexamethylenetetramine, 2 wt %, as hardener. It is also stable for 6 months, but requires 10 hours at 200 C to set. For use in temperatures lower than

120 C, a special resin, designated ED-7, was developed; it contains 5-7% epoxide groups and is the basis for powder composition UP-2191K which uses a hardener based on tri(dimethylaminomethyl) phenol and diphenylolpropane. Thermal stability was improved through matching the coefficient of thermal expansion of the substrate with that of the coating by varying the amount of additives, particularly fiberglass particles which also improved the durability of the coating. A lack of specialized epoxy-handling equipment inhibits the wider use of these materials, but a satisfactory process can be based on a standard double-screw mixer SN-100, a MAB-400 grinder and a NDTs-25 powder mixer. Figures 3; references 5 (Russian).  
[269-12672]

UDC 678.643'42'5.062.01:536.468

#### THERMAL AGING OF HALOGEN-CONTAINING FIRE-RESISTANT ELASTIC EPOXY POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 84 pp 27-29

STROGANOV, V. F., STEPANOVA, I. S., AMOSOVA, E. V., LIPSKAYA, V. A.,  
ZHURAVLEVA, L. V., and FEDEROVA, G. A.

[Abstract] Using Cl or Br to impart fire resistance to epoxy polymers generally results in high rigidity and low resistance to thermal aging. Compositions were sought which reduced these drawbacks. The basic test matrix was a condensation product of dicarboxylic, low-polymer diethyleneglycolsebacate with a low-polymer epoxydiane (UP-563) modified with several halogen-containing resins, including N, N-diglycidyl-2,4,6-tribromoaniline (UP-645) and a brominated diglycidyl ether of resorcinol (UP-637B). Thermal stability was improved by limiting halogen content to 4-7 mass % and adding inorganic fillers: red phosphorus (3 mass %) and powdered quartz (20 mass%). This provided low inflammability and good mechanical properties. Temperature testing at 70 C for 1000 hours increased the rigidity of the polymers, probably from the formation of cross-linkages between polymer chains, and lowered the relative elongation at breaking to 10-25%. The investigation showed that fire-resistant compositions (UP-5-198s and UP-5-198s-1) could be prepared which were suitable for hermetic applications under hydrostatic pressure. Figures 2; references 5: 1 Polish, 2 Russian, 2 Western.

[269-12672]

## HEAT RESISTANCE AND THERMAL STABILITY OF ALLYL POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 84 pp 32-33

SAVOS'KIN, V. M., LUNEV, L. V., ALEKSEYEV, N. N., PROTSENKO, Ye. I., and GONTAREVSKAYA, N. P.

[Abstract] A study is reported of thermooxidative destruction and changes in mechanical properties at high temperatures of homopolymers of the diallyl esters of orthophthalic, isophthalic, terephthalic, adipic, sebacic, maleic, and endomethylenetetrahydrophthalic acids; the triallyl ester of isocyanuric acid; and diethyleneglycol-bis(allylphthalate). Thermomechanical curves were constructed from measurements on a Gepler consistometer under a heat gradient of 1 deg/min. Temperature at the start of deformation was 35-370 C, apparently dependent on the distance between allyl groups in the component monomer. Thermal oxidation started at 260-360 C, with samples completely burnt with almost no residue at 500 C. The orthophthalic, sebacic and isocyanuric polymers were also heat treated at 200 and 300 C for 48 hours and analyzed with an IR spectroscopy. Heat treatment produced noticeably simpler spectra as absorption bands weakened, particularly  $2800-3000\text{ cm}^{-1}$ . Overall, the isocyanuric polymer showed the highest thermal stability, but its brittleness indicates it will be most useful as a copolymer to improve thermal characteristics. Figures 2; references 4 (Western). [269-12672]

## THERMAL AND SHOCK RESISTANCE OF POLYMERS FORMED FROM OLIGOESTER EPOXY BLOCK-OLIGOMER

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 84 pp 38-40

AMOSOVA, E. V., KHAKHALINA, N. F., LIPSKAYA, V. A. and SHOLOGON, I. M.

[Abstract] These polymers are widely used in hermetic applications, but their poor thermal and mechanical stability often leads to failure of seals. Modifications to improve these properties were sought using low molecular weight caoutchouc with terminal epoxide groups (specification PEF-ZAK) as an additive to block-oligomer UP-563 with a diethylenetetraminomethylphenol hardener. The breaking tensile stress of the composite was highest at 20 mass% caoutchouc; the relative elongation at breaking increased smoothly up to 60 mass % caoutchouc, then climbed rapidly. Improved strength and elasticity were accompanied by high stability when subjected to thermal cycling from -253 to 20 C. Adhesive strength of polymer with 20 mass % caoutchouc was also retained in the same temperature range. The modification had little effect on water absorbency. Figures 2; references 12: 9 Russian, 3 Western. [269-12672]

## DIETHYLENEGLYCOL-BIS-ALLYLCARBONATE--MONOMER FOR TRANSPARENT POLYMERIC MATERIAL WITH INCREASED ABRASION RESISTANCE

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 84 pp 52-54

ALEKSEYEV, N. N., BORBULEVICH, A. I., DEDOVETS, G. S., SAVOS'KIN, V. M., NIKOLAYEVA, A. I., PROTSENKO, Ye. I., NIKIFORENKO, V. S. and CHEKHUTA, O. M.

[Abstract] The monomer was synthesized by slowly adding one mole of bis-chloroformate-diethyleneglycol to a cooled mixture of 2.5 moles, each, anhydrous allyl alcohol and pyridine. The mix was then heated to 40 C for 5 hours, washed, decanted and vacuum distilled for a 75.6% yield. An alternate synthesis in toluene used caustic soda solution as an acceptor for the hydrogen chloride produced and gave a 52.7% yield. A third synthesis substituted some of the caustic solution with solid sodium hydroxide and gave a 72-74% yield. The best yield was obtained with 30% of the caustic added in solid form. The product contained impurities which affect its polymerization and color; purity was examined with a chromatograph. Recrystallization from methanol at -80 to -20 C or washing with nonorganic adsorbents and mineral acids did not improve the quality, but washing with a 1-5% solution of sodium hydroxide did significantly lower the impurities. Figures 2; references 11: 1 Russian, 10 Western. [269-12672]

## RELATIONSHIP BETWEEN TITANIUM-ALUMINUM COMPLEXES AND NATURE OF ARYLOXY RADICALS BOUND TO TITANIUM ATOM DURING ETHYLENE POLYMERIZATION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84 (manuscript received 25 May 82) pp 675-680

SHCHEGOT, Kzh., NOVAKOVSKA, M. and IVAN'SKI, L., Institute of Chemistry; Pedagogic Institute, Opole, Poland

[Abstract] A study was made of low pressure polymerization of ethylene in the presence of two catalyst systems: one group consisted of catalysts prepared by reaction of  $Ti(OAr)_2Cl$  with  $Al(C_2H_5)_2Cl$  and the other group consisted of catalysts prepared by reaction of  $Ti(OAr)_4$  with  $Al(C_2H_5)_2Cl$ , where  $Ar = C_6H_4X$  and  $X = H, Me-m, Me-p, OMe-m, OMe-p, Cl-m, Cl-p$  and  $Br-p$ . The activity of the complexes was found to increase with the acceptor properties of the aryloxy group. A quantitative relationship exists between the change in positive charge on the titanium atom and the rate of primary ethylene polymerization reactions. The chain growth rate of the polymer is related to the delta constant in terms of the Hammett equation. The effects of the nature of the aryloxy group on the polyethylene properties are described. Figures 4; references 23: 8 Russian, 15 Western. [256-12765]

## POLYMERIZATION OF ACRYLIC MONOMERS IN PRESENCE OF SULFURIC ACID

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 10 Jul 82) pp 687-693

KOZHEVNIKOV, N. V., TRUBNIKOV, A. V., STEPUKHOVICH, A. D. (deceased) and  
LARINA, N. M., Saratov State University imeni N. G. Chernyshevskiy

[Abstract] Sulfuric acid, a component present during the preparation of acrylic monomers, also influences their polymerization. A study of the effects of sulfuric acid on the polymerization of methyl and butyl acrylates shows that the dependence of polymerization rate on sulfuric acid concentration passes through a maximum. Sulfuric acid forms complexes with acrylic monomers whose composition depends on the relative concentrations of components in the solution. When sulfuric acid is present, the initiation rate and the molecular weight of the polymer are increased. Also, decomposition of polymeric peroxides is accelerated and the effective activation energy of polymerization is decreased. Figures 7; references 11: 7 Russian, 4 Western.  
[256-12765]

## STUDY OF INITIATION CAPABILITY OF PHENAZINE, ACRIDINE AND ANTHRACENE IN POLYMERIZATION REACTIONS OF BUTYLMETHACRYLATE IN TETRAHYDROFURAN

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 14 Jul 82) pp 694-698

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Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, UkSSR Academy of Sciences

[Abstract] Excited phenazine and acridine molecules are readily reduced in proton-donor solvents via a radical mechanism in the absence of oxygen. It was thus expected that these compounds, in the presence of proton-donors, could serve as active initiators of photopolymerization. A comparative study was made of the initiating capability of excited molecules of phenazine, acridine and anthracene in butylmethacrylate polymerization reactions in tetrahydrofuran as solvent. Interaction of excited initiator molecules with solvent and monomer molecules were studied by spectrophotometry and impulse excitation. A kinetic scheme for generation of primary radicals which initiate polymerization is presented. Figures 3; references 16: 7 Russian, 9 Western.  
[256-12765]

## EXPERIMENTAL STUDY OF PHASE DIAGRAMS OF CONCENTRATED SOLUTIONS OF RIGID-CHAIN POLYMERS OF VARYING RIGIDITY

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 17 Jul 82) pp 711-715

VOLCHEK, B. Z., PURKINA, A. V., MERKUR'YEVA, A. A., VLASOV, G. P. and OVSIANNIKOVA, L. A., Institute of High Molecular Weight Compounds, USSR Academy of Sciences

[Abstract] Phase diagram studies of concentrated solutions containing macromolecules of varying rigidity are important because most actual polymers are poly-dispersed to one degree or another, and because preparation of liquid crystal solutions from macromolecules of varying rigidity makes it possible to modify the properties of liquid crystal solutions or objects made from them. An experimental study was made of the conditions for the formation of lyotropic liquid crystalline order in mixed polymer solutions having varying geometric asymmetry. Equilibrium phase composition depends essentially on the difference in asymmetry in the mixed components. Figures 3; references 8: 3 Russian, 5 Western.  
[256-12765]

## CALORIMETRIC STUDY OF MELTING AND CRYSTALLIZATION OF IRRADIATED POLYETHYLENE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 19 Jul 82) pp 716-722

GORDIYENKO, V. P., DEMCHENKO, S. S., YANKOVA, S. T. and PRIVALKO, V. P., Institute of Physical Chemistry, UkSSR Academy of Sciences; Institute of the Chemistry of High Molecular Weight Compounds, UkSSR Academy of Sciences

[Abstract] Ionizing radiation can effectively modify the structure and properties of crystallizing polymers. By varying the temperature and dose it is possible to regulate the ratio of soluble and insoluble fractions, the degree of crystallinity and the melting point range of polyethylene. A study was made of the melting and nonisothermal crystallization processes of high density polyethylene irradiated with fast electrons in the crystalline state. Crystallization of the sol and gel fractions separately is shown to be possible. Irradiation of the polymer to 2 mega gram roentgens results in partial amorphosization. Partial cocrystallization of the sol and gel fractions is possible under conditions of rapid cooling of molten polyethylene. Figures 3; references 18: 11 Russian, 7 Western.  
[256-12765]

## EFFECT OF FILLERS ON POLYMERIZATION OF OLIGOESTERACRYLATES IN GELATION PROCESS OF POLYVINYL CHLORIDE PLASTISOLS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 19 Jul 82) pp 729-735

MOZZHUKHIN, V. B., GUZEYEV, V. V., SADOVA, S. P., KOTENKOV, V. I. (deceased),  
YUSHKOVA, S. M. and TAGER, A. A.

[Abstract] The adhesive strength of PVC-plastisol coatings can be increased by the addition of an oligoesteracrylate which polymerizes during gelation of the plastisol to form a three-dimensional lattice within the PVC matrix. This, and the formation of adhesion bonds between carbonyl groups of the oligomer and the substrate surface results in high total adhesion. When a filler is used in conjunction with an oligomer, the adhesion is increased synergistically due to deformation processes on the filler surface. In the present work, differential thermal analysis was used to study the effects of fillers on the polymerization of triethylene glycol dimethylacrylate and alpha, omega-bis-(trimethacrylpentaerythrite)-adipate during gelation of PVC-plastisol. Regardless of the compatibility of PVC and the oligoesteracrylate, selective adsorption of oligomer particles on the filler surface takes place. This results in an increase in local concentration of methacrylic groups near the filler particles and, consequently, polymerization of adsorbed oligoester molecules takes place at temperatures lower than that of a plastisol not containing a filler. Figures 8; references 7: 6 Russian, 1 Western.  
[256-12765]

## RHEOLOGICAL PROPERTIES OF HOMOGENEOUS AND NONHOMOGENEOUS BLENDS OF POLYVINYLIDENE FLUORIDE AND POLYMETHYLMETHACRYLATE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 27 Jul 82) pp 748-754

ROMANKEVICH, O. V., SUPRUN, N. P. and FRENKEL', S. Ya., Kiev Engineering Institute of Light Industry; Institute of High Molecular Weight Compounds, USSR Academy of Sciences

[Abstract] Although blends of thermodynamically compatible polymers are being intensively studied using new theoretical approaches and modern research techniques, the rheological properties of single-phase, double-component blends of such polymers differing in nature of the repeating link have not yet been well studied. In the present work, the rheological properties of homogeneous and nonhomogeneous composition blends of the thermodynamically compatible pair, polyvinylidene fluoride-polymethylmethacrylate were studied. The viscosity and high elasticity of blends of the pair differ according to the thermokinetic



composition, and therefore, depending on the experimental conditions, a large number of property-composition curves is obtainable. The magnitude of viscosity anomaly and the degree of divergence of an extrudate stream of compositionally homogeneous and nonhomogeneous blends provide different conclusions on the high elasticity of the system. Figures 2; references 47: 20 Russian, 27 Western.  
[256-12765]

UDC 541(64+15)

LOW TEMPERATURE RADIATION POLYMERIZATION OF TRIETHYLENE GLYCOL alpha, omega-DIMETHACRYLATE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 16 Aug 82) pp 790-793

DUFLOT, V. R., KLINSHPONT, E. P. and CHIKIN, Yu. A., Branch of Scientific Research Physical Chemical Institute imeni L. Ya. Karpov

[Abstract] The kinetics of postradiation polymerization of industrially produced TGM-3, i.e., triethylene glycol alpha, omega-dimethacrylate was studied calorimetrically. Electron paramagnetic resonance spectra of low temperature gamma-radiolysis show that radicals are transformed to propagating macroradicals at 14°K. Intensive postpolymerization commences after transition from the glassy to the liquid state. The effective activation energy for low temperature polymerization was determined. Figures 5; references 14: 10 Russian, 4 Western.  
[256-12765]

## RUBBER AND ELASTOMERS

### ARSENAL OF CHEMISTRY--COMPETITION FOR LENIN PRIZE

Moscow PRAVDA in Russian 31 Mar 84 p 3

[Article by Academicians N. Kochetkov and N. Emanuel']

[Text] Our country is a pioneer in the area of synthesis of rubber. The world's first industrial production of butadiene rubber was already organized in the early 30's, using Academician S. V. Lebedev's method. Over the past 50 years various types of synthetic rubbers for tires and rubber technological items have been developed and manufactured on a large industrial scale, significantly surpassing the initial production in a number of properties. The crowning achievement in this area was the synthesis of rubbers which were completely substitutable for natural rubber.

General purpose rubbers are usually synthesized by polymerization of isoprene and other monomers under the influence of catalysts. However, each monomeric link entering the polymer chain may have a different structure, and the properties of the material depend primarily on the elementary links which determine the "architecture" of the entire polymer. For example, if the butadiene link has one type of spacial distribution of the carbon and hydrogen atoms, then the polymer appears as a crystalline filament with a fusion temperature of plus 130° Celsius. If they are distributed differently, rubber forms which retains elasticity to a temperature of minus 108°. A third variant in the chain structure leads to rubbers and resins which become brittle even at a temperature of approximately zero, etc.

These examples illustrate the significance of research directed at clarifying the nature of active centers (catalyzers) and the means of obtaining rubbers with a given structure in the monomer units. In essence the catalytic agent of a specific operation is its "printing press"--assisting the monomer unit to be placed in a strictly determined position. Individual atoms of transient metals play the role of the "printing press."

The fundamental research of Academician V. A. Dolgopolsk and Doctor of Chemical Sciences Ye. I. Tinyakova in the area of metalloorganic catalysis is most significant for the future of rubber synthesis. They have provided for the first time a theoretical basis for these processes. Instead of complex systems with many components for studying the course of polymerization, the authors

used metallocorganic compounds of titanium, chromium, nickel, molybdenum and other metals which act as active centers of polymerization. The majority of these compounds were synthesized for the first time.

A new area of the metallocorganic catalysis of polymerization processes has been discovered. It has been established that, using the same metal, all the theoretically possible structures of monomer units can be obtained.

The nature of the active centers and the mechanism of this complex process has been shown experimentally for the first time. The authors' theoretical research in this area essentially revealed the possibility of predicting the catalytic action in relation to the nature of the metal and other atoms or groups associated with it. A number of original catalytic agents were recommended for obtaining stereoregular polymers and copolymers.

It has been shown that a very small quantity of admixtures interacting with the transient metal ("printing press") alters the entire polymeric chain, diminishing the properties of the material. This makes it necessary to use very pure products to obtain stereoregular rubbers.

Often in the production of plastics and rubbers with the necessary set of properties a mixture of different monomers is used which during polymerization form high-molecular compounds which contain in the molecule monomers which vary in chemical nature (processes of copolymerization). The authors studied the basic laws regulating copolymerization of various monomers in coordinated systems in detail and showed their principal distinctions from earlier known catalytic systems.

The established laws are in conformity with the concepts advanced by the authors on the mechanism of coordinated polymerization. Rubbers formed from butadiene, isoprene and other dienes contain reactive double bonds in the chain which, under the influence of the catalytic agent or its individual components undergo diverse chemical transformations in the course of which new structural elements form, destroying the homogeneity of the molecular structure. The authors studied the mechanism of these secondary reactions.

The research cycle led to the discovery of a new type of active centers—combinations of bivalent carbons with transient metals, chain reactions initiated at usual temperatures with a break in the double bonds in olefins. These reactions, somewhat unexpected to chemists, proceed with great rapidity without heat effects. For the first time concepts on the chain nature of reactions in olefins and cycloolefins and on the carbene nature of active centers have been formulated and substantiated experimentally. The mechanism for the formation of carbene complexes during decomposition of molybdenum, tungsten, rhenium and tantalum compounds, which causes the chain process, has been studied in detail.

For industrial use a catalytic system is recommended which allows rubber characterized by excellent frost resistance to be obtained at a temperature of minus 30° from cyclopentene.

The original research on the decomposition mechanism of metalloorganic compounds of different metals widely used in catalysis of hydrocarbon conversions is particularly significant.

The fundamental research of B. A. Dolgopolsk and Ye. I. Tinyakova is outstanding, original work which has great theoretical and practical significance. It is worthy of nomination for competition for the Lenin Prize.

12318

CSO: 1841/220

## ACCELERATION IN OMSK

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 Mar 84 p 2

[Article by SOTSIALISTICHESKAYA INDUSTRIYA special correspondent, V. Kremer]

[Text] According to the two-month totals, growth in labor productivity above plan-level was 1.4 percent in the Omsk Tire Association.

The commitment to additional production-cost reduction is being fulfilled successfully. A half a million rubles in above-plan profits has been achieved.

Over a two-month period, 212 tons of rubber, 9,000 square meters of textile cord, approximately 12 tons of metal cord, 264 tons of standard fuel and 669,000 kilowatt hours of electric energy have been saved.

Losses in worker time due to outages, absenteeism and vacations with administrative permission have been reduced in comparison with past years by 20 percent.

Approximately two thousand tireworkers engaged in a competition for personal plans to increase labor productivity.

In the various production sectors of the association, 190 brigades were created which operate according to the coefficient of labor participation. Almost a third of these are comprehensive. The first self-financing collectives are running smoothly.

Due to the introduction of suggested innovations, an economic effect in the sum of 4.3 million rubles is projected.

Because of production automation and mechanization, the labor of 50 persons currently engaged in manual work will be eliminated.

The introduction of a new automatic production line for vulcanizing radial tire casings has increased labor productivity in this sector by 1.5 times.

Replacement of old equipment in the bicycle tire shop made it possible to increase production of inner tubes by 700,000.

"To achieve in 1984 a one percent, above-the-plan increase in labor productivity and an additional 0.5 percent reduction in production cost" is written in the socialist collective commitments of the Order of Lenin Omsk Tire Association. These words on the banner above the gate greet everyone changing shift today. What do they mean? What is their real content?

If these percentages are translated into more comprehensible numbers, one gets the following: a one percent growth in productivity means an output (additional to the plan) of tens of thousands of tires for the powerful Kama Automobile Plant and the mighty Ural cross-country vehicles; the Byelorussian heavy-duty dump trucks; the Gorkiy, Ulyanovsk and Moscow trucks; the Kovrov motorcycles; the Penza bicycles, and many makes of agricultural and highway machinery. A half a percent reduction in production costs is equivalent to a saving of scarce rubber and cord, various chemical reactants, fuel and energy worth almost two million rubles. All this has been calculated precisely in the association offices, discussed at party and worker meetings and included in the current plans. The tasks were brought to shops and brigades and adopted to be enacted.

The workers of one of the largest enterprises in the tire industry understood well that achieving such a reduction would not be simple. The association immediately reached the limit where the obvious reserves, lying close to the surface, had been utilized almost completely.

Expenditures per ruble of goods produced, for example, were the lowest in the branch in Omsk. Keeping in step with the quickly growing demand, recently they had done some reconstruction here, which brought the efficiency level to that of a large, newly constructed factory. This made it possible, in particular, within the same area and with the same number of workers, to double the output of modern radial tires.

Much was done to intensify production. Technological equipment is run at 96 percent capacity. The basic shops operate around the clock. Six days a week the shift is comprised of core personnel, and on Sunday the repairmen work.

With regard to achievable and actual possibilities, the Omsk tireworkers also set the goal for the year of ensuring a 0.9 percent growth in labor productivity. But the collective, in response to the decisions of the December (1983) and February (1984) CPSU Central Committee Plenums, set out to exceed the established plan, using this indicator, by a bit more than twice the amount.

What are the Omsk workers counting on? What reserves will they put into action?

In the brigade. We succeeded in speaking to brigade leader M. Abbasovyy before the beginning of the shift. He glanced at his watch impatiently every now and then as though he knew in advance that the shift would be difficult.

In six hours Abbasovyy's brigade should produce 210 tire coatings. This is a plan goal and of prime importance. Plus, in addition, it is necessary to make not less than 20 tires in order to fulfill the annual plan for celebration of the Great October Revolution. Today, Yuryy Derezy would not be on the assembly team there. His vacation had begun. But this is not what was troubling the brigade leader. They would be able to manage with five--assuming there were provisions. But the provisions were in a bad way.

The rubberized cord for the tire casings for the special tropical design did not "ripen" as it should have. They began to examine the first coil--the rubber was fresh, sticky. Cutting out bracelets from such material is, in fact, possible. But how could they be taken to the assembling bench? They could not be hauled on the truck--they would slip off. With each individual bracelet taken separately it would be a slow process. For the bracelet workers, this was not normal work, but boring, exhausting toil. And the assemblers would be idle for a minimum of an hour and a half.

Quickly evaluating the circumstance, the brigade leader decided to re-group forces. He ordered that in order for the bracelet worker not to be distracted from his work, the assembly team would get the materials themselves. Here, the women worked to the utmost. They cut out a slug of rubber in 15 minutes. And soon, one after another of the five machine benches were put into operation.

After the shift we were sitting again in the office of the foreman, and M. Abbasovyy said, "Initially in our brigade there were only assembly teams. Then we had the idea to make it comprehensive, to unite in one collective all those upon whom the final result depended. What did this achieve? A great deal. Earlier the question of helping neighbors in their sector did not even arise--they had their work, and we had ours. Now, mutual assistance has become the order of things. If necessary, an assembly worker may work for a certain time as a transport worker or stand at the cutting machine. And he doesn't mind if he loses his personal "piece rate" because of this. In fact, today, of prime importance is the total brigade earnings, the quality and economy of materials."

During a two-and-a-half-month period, M. Abbasovyy's comprehensive brigade of the first assembly shop assembled 564 tire casings over and above the plan, and they were of the highest quality. Because of combining professions they found it possible to free 3 out of 17 persons placed according to the state schedule. Labor productivity of the brigade grew by almost 10 percent.

In the shop. Monday, March 19, at 8:30 the electronic tabulator indicated that the first stage assembly was 30 tires behind schedule. Frankly speaking, this in itself was not so significant--the morning shift had not succeeded in setting up rotations properly. However, the insufficiency of carcasses soon was felt by the assemblers at the second stage, then by the vulcanizers. The difficulty at the start was reflected in the entire assembly line.

The computer needed only seconds in order to give complete information on the state of affairs in the sector. The radial tires production director, B. Smyk, habitually ran his eyes over the column of numbers. The majority of assemblers had done about seven or eight carcasses, which corresponded to the norm. But several persons clearly had lagged behind. The picture was clear. The only thing unclear was what the young foreman, Nadezhda Gizyeva, thought about this.

"I have already discussed this with each person individually, Boris Filippovich," the foreman said, handing the director a printed list, done on the computer according to her request somewhat earlier. "In less than an hour we will be on schedule."

The Omsk workers are the first in the industry to introduce an automated information dispatch system for calculating and controlling production of radial tires destined for the Kama Automobile Plant and the Likin buses. Electronic tabulators established in visible places report each minute on the progress in fulfilling the shift task for the sectors. The computer controls approximately one hundred working positions, gives out data on production earnings for each bench upon request, reports on the progress. The computer controls approximately 100 work positions, gives out data on the manufacturing of the product at each bench, reports idle times, pin points each infraction of the technological regulations.

The operational control and record helped adjust the precise work rhythm, firm up discipline, increase responsibility. Any worker, having glanced at the tabulator, sees how his sector is fulfilling the plan, how much still remains to be done before the end of the shift. And additionally, what a help this is to the foremen and shop directors who do not have to say it.

They have put the computer to work solving another problem of the first order as well: ensuring an above-the-plan decrease in the cost of production. The computer takes over the control of one of the most complex technological operations--the process of rubberization of metal cord. The main difficulty lies in obtaining the optimal thickness in rubberized covering, applied on both sides to the network of metal filaments. The field of tolerance is hundredths of a millimeter. During manual operation such precision lies at the limit of man's capabilities.

According to the most careful calculations, the computer makes it possible to decrease the thickness of the covering by 0.01 millimeters, reduces the quantity of wastes and defects by 13 grams. Do not be misled by this insignificant number. Over the course of a year of production volume, this is a saving of tens of tons of costly raw material.



In the department. In the comprehensive plan developed by association specialists for increasing production effectiveness for 1984, opposite many of the measures noted is written "executor--Department of Mechanization and Automation."

In the department they are proud of their reputation for "quick action service." In addition to the small construction group, it includes an engineer's shop where innovations are immediately copied in numbers necessary for production. The "head" and "hands" are in complete agreement, working toward the overall goal. This, to a great extent, shortens the path from the idea to embodiment and helps fulfill the task in compressed time.

In the sector issuing small dimensional bicycle inner tubes, fatiguing manual labor predominates. Because of this, a large labor turnover, low productivity and defects occur. In a word, it is a typical bottleneck which cannot be by-passed. The backward technology in this sector was increasingly exerting a drag on the bicycle shop.

The creative plant brigade headed by engineer-builder I. Androsovyi undertook to solve the problems. And they grappled with the complicated problem for at least a month. A new technology introduced for the first time in the sector for joining tubes made it possible to reduce the work force by 12 men, and the quality of production improved somewhat.

Together with other subdivisions the "quick action service" actively participated in the struggle for an above-plan growth in labor productivity.

Now, work on implementing the program of comprehensive mechanization of the final operations in the bicycle tire shop is in full swing, which has made it possible to reduce the number of personnel by half. A highly productive, comprehensive assembly unit has already been released. In the engineer's shop assembly of original hanger units for transporting articles has begun. By the way, both of these innovations (created by the department director, V. Gapanyuk) are recognized as inventions.

And in the designs of the plant constructors, new mechanisms and automatic devices are being born which will be released this year. The persistent search for reserves today goes in all directions. Every engineering office of the association, every shop and brigade has found its place in this matter. The results achieved after the first two months speak of impressive efficiency.

12318

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STRENGTH OF RUBBER CONTAINING RUBBER PARTICLES AND GROUND RUBBERIZED CORD

Moscow KAUCHUK I REZINA in Russian No 5, May 84 pp 6-8

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[Abstract] The addition of scrap rubber particles to rubber mixtures usually lowers the strength of the rubber, but fiber additions could be used to increase the strength. A rubber mix based on SKI-3 with 30 mass parts hydrocarbon PM-50, 10 mass parts PM-100, and a sulfur-containing vulcanizer was supplemented with rubber particles (0.8-1.0 mm) and/or ground kapron cord byproduct from tire manufacture, milled through rollers with a 0.15 mm separation. The resulting rubber showed the expected drop in strength under tension when only rubber particles were added, but a strength nearly independent of rubber particle content (under 40%) when as low as 3.6% fiber was also added. With a cord content over 20%, the strength of the triple mix exceeded the strength of the initial rubber mix so long as the fibers were oriented parallel to the stress. When they were perpendicular to the stress, strength dropped for all mixtures. Figures 3; references 8: 7 Russian, 1 Western.  
[292-12672]

UDC 678.046.2:678.043:620.192.41

MUTUAL INFLUENCE OF ADDITIVES AND VULCANIZING AGENT ON CRYSTALLIZATION OF  
NATURAL RUBBER

Moscow KAUCHUK I REZINA in Russian No 5, May 84 pp 8-9

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[Abstract] The distribution of polysulfide vulcanizing agents in a rubber matrix, and the character of binding processes, change in the presence of non-soluble fillers, partly due to surface absorption of the agents. The present study assessed the effect of adding 0 to 60 mass parts of technical hydrocarbon PM-75 or of aerosil-175 per 100 mass parts of natural rubber. Samples also contained 2 mass parts zinc oxide and stearic acid and either 3 mass parts tetramethylthiuram disulfide (type 1) or 2 mass parts sulfur and 1 mass part sulfenamide-Ts (type 2). Samples were vulcanized at 142 C for 30 minutes.

Results are expressed as kinetic curves of the change of the coefficient of reducibility of the samples. In general, the introduction of small amounts of fillers slowed crystallization, while larger amounts speeded it up. For type 1 samples, the initial coefficient of restorability was independent of fillers, but the half-time of crystallization was affected. For type 2 samples, even the initial coefficient decreased sharply as fillers were added. Due to different migration rates of the vulcanizing agents to the surface of the fillers, the crystallization rate of type 2 samples was sharply higher because of the growth of the rate of nucleation. Figures 2; references 14: 11 Russian, 3 Western.  
[292-12672]

UDC 628.543.12:543.544:678.065

#### USE OF VAPOR-PHASE ANALYSIS FOR ANALYTICAL CONTROL OF WASTE WATER FROM TIRE PRODUCTION

Moscow KAUCHUK I REZINA in Russian No 5, May 84 pp 27-28

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[Abstract] Waste water analysis is continually more important because of its role in protecting the environment. High-sensitivity gas chromatographic analysis was used for identifying dangerous volatile components from rubbers, softeners, vulcanizing agents and graphited hydrocarbons used in tire production. Preliminary samples were prepared by boiling 5 gm rubber samples in water, cooking hermetically sealed samples of the resulting solution at 80°C for 15 minutes, then chromatographically analyzing the air-vapor mixture over them. Volatile compounds identified were benzene (1.8 mg/l), toluene (2.0 mg/l), a mix of styrene and o-xylene (0.6 mg/l), and p- and m-xylene (10.4 mg/l). Further extraction of volatile components by aerating with Ne increased the sensitivity of the method, but did not change the mix of toxic volatiles. A similar analysis on actual waste water from tire manufacture showed benzene (2.3 mg/l), styrene, toluol and p-xylene, the same basic components as in the preliminary sample, but with lower concentrations probably due to the less severe conditions. Vapor phase analysis appears to be a rapid and accurate means of determining volatile components in these waste waters. References 5: 4 Russian, 1 Western.  
[292-12672]

RELAXATIONAL PROCESSES IN ELASTOMERS RELATED TO SUPERMOLECULAR STRUCTURE,  
STUDIED BY CREEP ANALYSIS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 26, No 4, Apr 84  
(manuscript received 22 Jun 82) pp 681-686

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[Abstract] A previously described method of creep analysis was used to study the effects of fluctuating supermolecular structure on slow relaxation processes in SKD, SKEP and butadiene-methyl styrene elastomers. Supermolecular structure was controlled by altering the temperature-time conditions in preparing the samples. This permitted detection of molecular ordering processes in the elastomer. Development of high elastic deformation depends on restructuring and disruption of the fluctuating supermolecular structure. Figures 4; references 16 (Russian).  
[256-12765]

UDC 634.0.813.4

FIRE-PROTECTIVE PROPERTIES OF SOME PHOSPHOROUS-CONTAINING COMPOUNDS

Riga KHIMIYA DREVESINY in Russian No 3, May-Jun 84  
(manuscript received 29 Apr 83) pp 99-102

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[Abstract] Organophosphorus compounds significantly improve the fire-resistance of wood. The mechanism of this protection was studied with differential thermal and thermogravimetric analysis and electro-paramagnetic resonance. The effective energy of activation of the overall process of thermal decomposition was significantly higher for unprotected wood. The effect of the phosphorus-containing compounds on the formation and stabilization of free radicals was studied by pyrolyzing samples in sealed ampules at 300 and 500 C for 5, 15 and 30 minutes. Free radical concentrations were higher in treated samples, but their reaction kinetics with atmospheric oxygen showed them to be more stable than free radicals in untreated wood. Similarly, the time of self-sustained burning and the weight loss on ignition fell steadily with increasing free-radical concentration. Figures 3; references 5: 1 Polish, 2 Russian, 2 Western.

[293-12672]

UDC 674.87:547.979.8

GROUP COMPOSITION OF CHLOROPHYLL-CAROTENE PASTE AND OF PROVITAMIN CONCENTRATIONS OF CONIFEROUS GREENS

Riga KHIMIYA DREVESINY in Russian No 3, May-Jun 84  
(manuscript received 17 May 83) pp 109-112

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[Abstract] Acidified solutions of pastes from pine greens (Lisinskiy and Strenchskiy shops) were extracted with ether. Free acids were separated by washing with a water solution of NaOH with subsequent acidification, ether extraction, and column fractionation into resinous, fatty and simple acids using various mixtures of petroleum ether and diethyl ether. Neutral substances and esters were saponified, and bound acids and nonsaponifiable compounds extracted. The neutral substances were also subjected to column

fractionation and subsequent IR spectroscopy. Overall, samples had about 60% acids and 30% nonsaponifiable substances. The provitamin concentrate from fir greens (Lisinskiy shop) was also extracted. It had less than 20% total acids with no free resinous acids and about 75% nonsaponifiable substances. For the pastes, the most prominent classes of neutral compounds were esters (10-17%), alcohols (58-60%) and polyoxycompounds (20-21%); for the provitamin concentrate, esters (32%) and alcohols (50%). The esters were further fractionated into subgroups, as were some of the less plentiful neutral substances (aldehydes and oxides). The two pastes showed only minor variations in group composition; they differed from the concentrate in proportions of groups and in some individual components. References 5 (Russian).  
[293-12672]

CSO: 1841

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